

1B-AC

**SERVICE MANUAL  
AND PARTS LIST  
FOR YOUR  
ELECTRIC PLANT**

**READ THIS BOOK CAREFULLY AND  
PRESERVE FOR FUTURE REFERENCE**

# **WARNING**

THIS ELECTRIC PLANT MUST BE INSTALLED AND BE OPERATED ACCORDING TO OUR INSTRUCTIONS. AN IMPROPER INSTALLATION OR THE USE OF OIL OR FUEL OTHER THAN THAT RECOMMENDED IN THIS MANUAL, RELIEVES THE MANUFACTURER OF ALL RESPONSIBILITY FOR PLANT PERFORMANCE.

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**READ THIS SERVICE MANUAL CAREFULLY!**

# IMPORTANT!!!

## USE OF LEADED FUELS

The performance of gasoline engines deteriorates with use until it eventually becomes necessary to remove the carbon, grind the valves, install new spark plugs, etc.

Lead is added to many gasolines to increase the octane rating. Due to the action of the lead in the combustion chamber, on the valve seats, and on the spark plugs, the use of such fuels causes the engine performance to deteriorate more rapidly. When using highly leaded fuel, there is a regularly increasing lead content in the crankcase oil.

If the gasoline contains  $\frac{1}{2}$  cubic centimeter, or less, of lead per gallon there is little such effect. However, as the proportion of lead is increased the deterioration in engine performance is greatly accelerated.

Under normal operating conditions with unleaded fuel it may be necessary to remove carbon each 1000 operating hours, grind valves each 1000 to 2000 operating hours, clean spark plugs each 200 operating hours, and change crankcase oil each 100 to 200 operating hours.

When using Army 80 octane fuel, aviation 100 octane fuel, or other fuel containing more than 2 cubic centimeters of lead per gallon, change the crankcase oil each 50 operating hours. When using such highly leaded fuels it may be necessary to remove carbon and grind valves each 100 to 200 operating hours, clean spark plugs each 50 operating hours, and replace them each 100 to 200 operating hours. If carbon is removed every 100 to 150 operating hours, the periods between valve grinding jobs usually can be considerably lengthened.

When using leaded fuels, inspect the engine more often and give it the more frequent service required.

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## **GENERAL INFORMATION**

**THE PURPOSE OF THIS BOOK.** This instruction book is furnished so that the operator may learn of the characteristics of the plant. A thorough study of the book will help the operator to keep the plant in good operating condition so that it will give efficient service. An understanding of the plant will also assist the operator in determining the cause of trouble if it occurs.

**KEEP THIS BOOK HANDY.** Such simple mistakes as the use of improper oil, improper fuels, or the neglect of routine servicing may result in failure of the plant at a time when it is urgently needed. It is suggested that this book be kept near the plant so that it may be referred to when necessary.

**SERVICE.** If trouble occurs and the operator is unable to determine the cause after a thorough study of the book, or if he is unable to determine what repair parts are required, the manufacturer will, upon request, furnish any advice needed. When asking for advice, be sure to state the Model, Serial, and Generator numbers of this plant. This information is absolutely necessary and may be obtained from name plates on the plant. Be sure to give all other details available.

## **WARRANTY**

Each Electric Generating Plant is:

1. **WARRANTED** to produce its rated output as stamped on its nameplate, when installed and operated according to the manufacturer's instructions.
2. **WARRANTED** to be in good condition mechanically and electrically when shipped from the factory.
3. **WARRANTED** against defective workmanship and materials for a period of one year after it leaves the factory. Within that time, any parts will be repaired or exchanged free of charge if they are returned, transportation prepaid, to the factory, and are found to be defective by factory inspection.

This warranty does not include or cover standard accessories such as carburetors, magnetos, fuel pumps, etc., made by other manufacturers. Such accessories have separate warranties made by the respective manufacturers. Repair, or exchange, of such accessories will be made by us on the basis of such warranties.

This warranty does not include or cover reimbursement for labor or material cost incurred in remedying any claimed defective condition in any plant unless previously authorized by the factory.

This warranty is effective only if conditions herein are complied with.

## GENERATOR DETAILS

GENERATOR - Standard generators are of the four pole type. The armature is coupled directly to the crankshaft by a male and female taper. The armature arbor being hollow, a draw-bolt passing from the crankshaft through the armature arbor. A nut at the rear retains the armature arbor taper in the crankshaft.

All generators are forced air cooled by a blower mounted at the engine end of the generator. The outboard end of the armature is carried in a grease sealed ball bearing which requires attention once each six months. On "Electric Start" plants a control box is mounted on top of the generator. On the "Manual" plants a fuel tank is mounted there.

AC generators produce both Alternating and Direct Current; the Direct Current series winding in the generator serves to crank the engine from the battery. The DC output from the plant while the plant is operating, serves to re-charge the battery and excite the field of the alternator. Alternating and Direct Current windings are on one armature shaft. This direct current for starting and charging is available on the remote control and full automatic plants.

An extremely large commutator and two collector rings pass DC and AC current through carbon brushes. All of the windings of the generator are impregnated with insulating varnish and baked. The generator frame is a rolled steel ring, machined inside. The armature laminations are 26 gauge silicon steel and the pole piece laminations are 22 gauge silicon steel. The generator is condenser and radio shielded to prevent radio interference. All generators operate at a maximum 40 degree Centigrade temperature rise. Voltage regulation is close from no load to full load due to the inherent design of the generator.

## CONTROLS

MANUAL STARTING - "Manually Started" models are equipped with a rope starter sheave at the blower end of the plant. Starting is accomplished by winding the starting rope, in a clockwise direction, around the rope sheave and pulling rapidly.

REMOTE CONTROL - The "Remote Control" models are equipped with two 6 volt batteries in series. They may be started by pushing a button mounted in the control panel on top of the generator, or by remote control buttons located any distance up to 500 feet from the plant. The electrical controls consist of a starting relay, a reverse current relay, an ammeter, a rheostat and connecting terminals. Plants with this control can be started manually if necessary.

## INSTALLATION

The proper installation of this plant is absolutely necessary for satisfactory and continuous service. Carefully observe the following instructions.

LOCATION - The plant should be located centrally with respect to the electrical equipment it is to operate. This allows the use of small size current carrying wires. As a result there is less voltage loss, the equipment operates more satisfactorially and the entire system is more efficient. Also, the control of remote plants is more positive.

If the plant is to be operated as a portable unit, it should be protected against extreme exposure to the elements. If used outdoors in extremely cold weather, extra precautions are necessary to provide easy starting and proper lubrication of the engine. See the lubrication instructions that follow. Move the plant only when necessary and then only with the greatest care.

The plant should not be installed where the air is extremely humid. But, if this condition cannot be avoided, frequent inspection of parts which are exposed to the air, particularly the generator and control units of the plant, should be made to insure that humidity is not causing detrimental corrosion and failure of electric plants to operate. These plants are impregnated, plated, and otherwise guarded against corrosion as far as humanly possible but corrosion cannot be overcome entirely under adverse conditions.

If permanently installed in a mobile vehicle, the location should be such that there will be proper ventilation and means for exhausting the gases. The plant should be insulated so that mechanical noises and slight vibration will not effect the operation of other equipment aboard the vehicle.

VENTILATION - This is an important factor because overheating will reduce the efficiency and output of the plant and may result in serious damage.

Any gasoline engine generates a great deal of heat so that ample means must be provided to remove that heat. If plant is permanently mounted, the room dimensions should be at least 10 feet by 10 feet. The plant should be at least 24" from any wall. Air outlet openings 18" square and air inlet openings 16" square properly protected or shielded will provide satisfactory air circulation. A stack or cupola built in the roof will help to dissipate the heat when the plant is shut down, cutting off forced air circulation as provided by the plant blower.

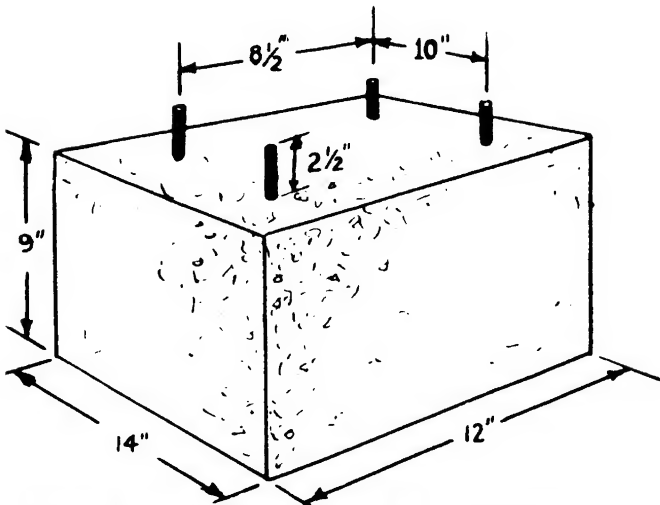
When installed aboard a mobile vehicle, the mounting compartment should be as large as possible and plant should be at least 12" away from any wall. For such compartments provide air outlets and stacks directly above the cylinders. Also provide air inlets with openings directly opposite the blower. A stack from this opening to within 1/2" of the blower will help. Openings in the floor may be used.

In extremely cold weather, it is possible to control the temperature of the room or compartment in which the plant operates by simply closing a portion of the air discharging openings. In this way, a normal temperature can be maintained in a room even though the temperature outdoors might be as low as 30 degrees.

MOUNTING BASE - If the plant is installed permanently on a base, it should be high enough from the floor to allow easy access to all of the parts of the plant, also to guard against damage occurring to the plant caused by its being bumped by other objects in the room. The base should be at least 12" high for convenient servicing. The plant should never be bolted permanently to any foundation. Shock absorber mountings have been provided to prevent vibration from reaching the mounting base these are either helical coil springs or sheared type rubber bushings.

## PLANT BASE

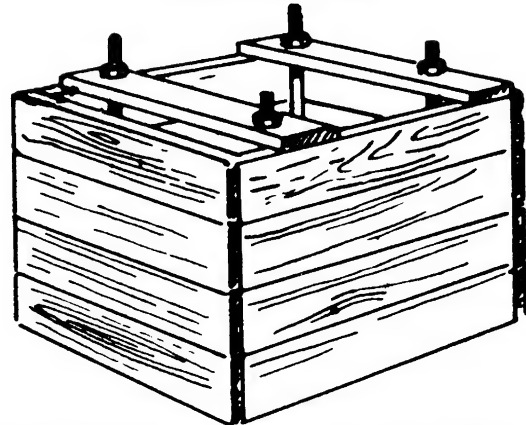
### CONCRETE BASE



Above base dimensions are a minimum and may be larger. Keep same bolt spacing. The base must be at least 24" from any wall.

Use 4 - 3/8" x 8" bolts. See that they extend 2 1/2" above the top of the concrete.

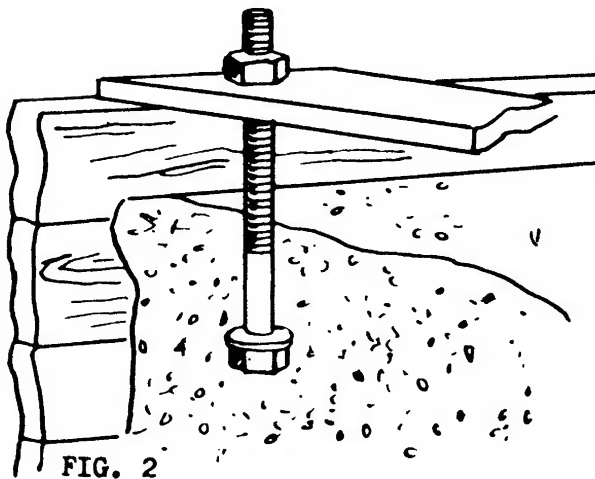
### CONCRETE FORM



A form should be built into which the concrete can be poured and allowed to harden. The form should be large enough so base will be of the minimum size.

A mixture of 1 part cement, 2 parts sand and 4 parts gravel or crushed stone may be used. Fill form, tap down but do not move bolts. Allow to harden for three days.

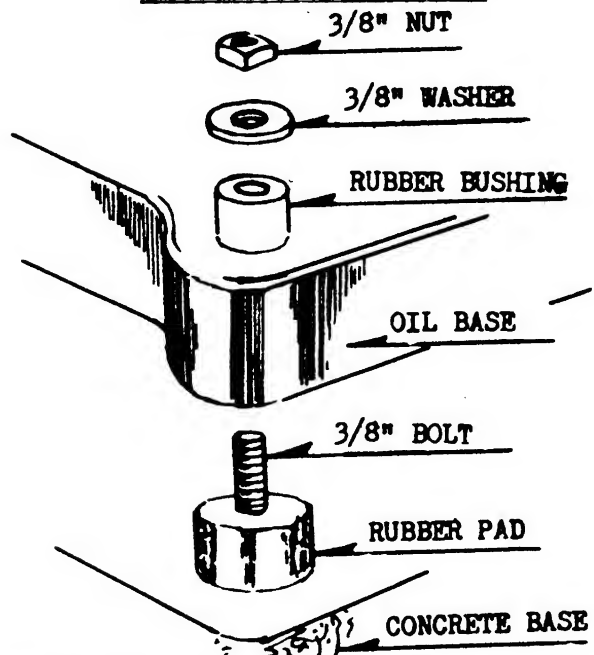
### MOUNTING BOLT SUSPENSION



Suspend mounting bolts from cross cleats nailed to the top of the concrete form before pouring concrete. Place large washer under head of bolt and adjust for proper height - 2 1/2".

Be sure top of foundation is level and smooth to prevent plant base breakage.

### RUBBER BUSHING DETAILS



Use the rubber mounting bushings supplied with the plant.

Place one bushing between plant and base so that bushing fits in recess in plant. Set Plant in place. Assemble balance of mounting as shown above.

Tighten nuts but not so that bushings flatten or compress.

## INSTALLATION DETAILS

THIS COMPLETE ELECTRIC PLANT has all the accessories and fittings necessary to put it into average service. For special use or mounting conditions additional equipment may have to be purchased to meet those conditions.

FUEL TANK - The manual plants have a 2 gallon fuel tank mounted over the generator. The SELF-STARTING and REMOTE CONTROL plants have a separate 5 gallon wall mounted fuel tank which supplies gasoline through the fuel pump to the carburetor.

A larger fuel supply tank may be installed underground. This is recommended for continuous use of the plant. It should be installed according to the local code along the lines of the information shown on page 8.

CONTROL PANEL - The control panel of the REMOTE CONTROL plants is mounted directly above the generator. The manual plants have no control panel. The FULL AUTOMATIC plants have a separate wall mounting panel in addition to the panel furnished with the REMOTE CONTROL PLANTS.

EXHAUST SYSTEM - A flexible exhaust tubing and automotive type muffler are furnished as accessories. The tubing connects directly from the exhaust manifold of the engine to the muffler which is mounted on the outside of the enclosing room. See page 8.

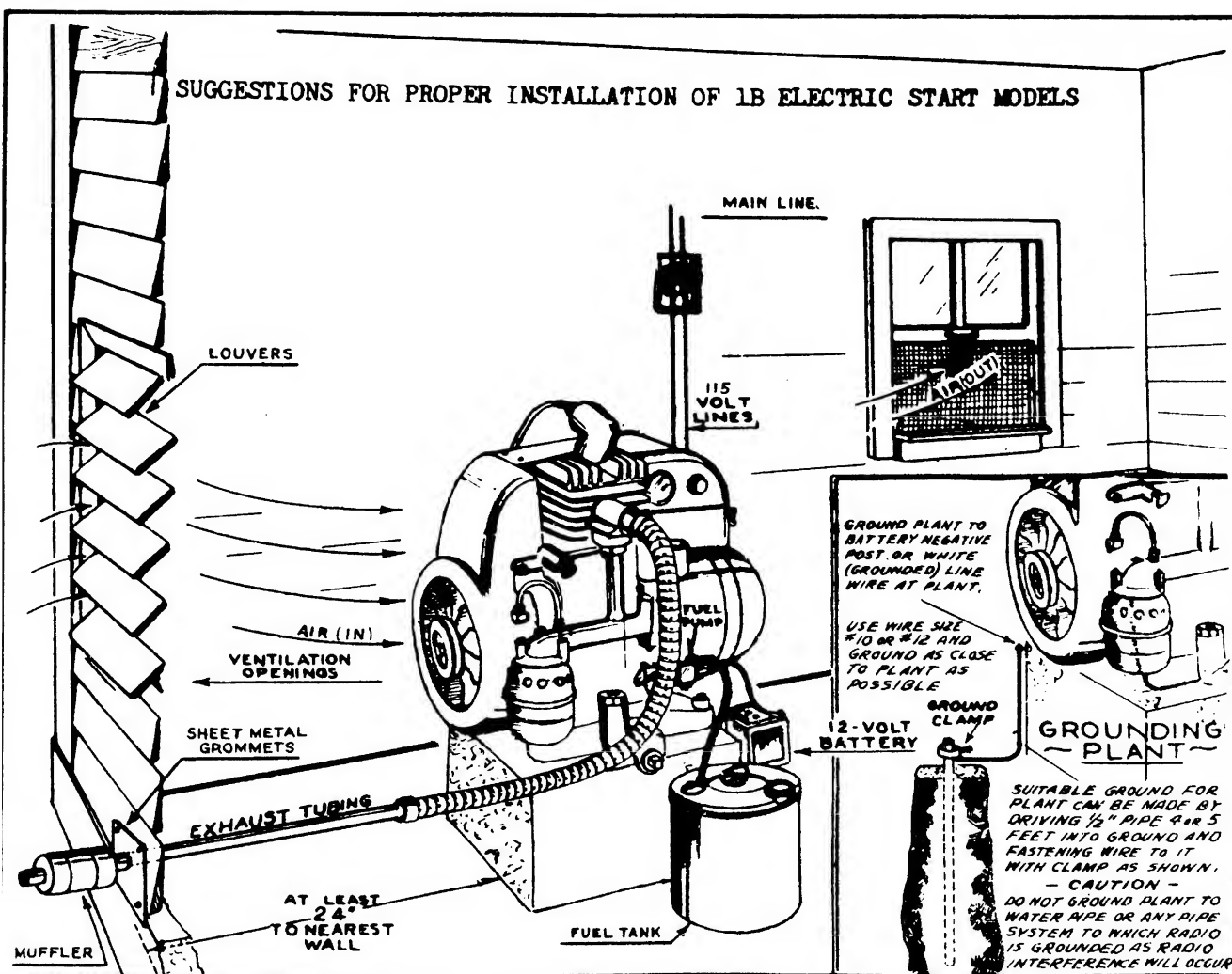
If it is desired to extend the exhaust system over 6 feet it will be necessary to increase the size of the tubing by one size. Rigid pipe may be used but flexible tubing must always be used for the connection to the plant. An underground muffler may be installed and this would be done according to page 8.

Do not have the exhaust tubing or muffler rise above the height of the exhaust manifold of the engine. If it is ever necessary to do this, install a water trap in the line. This may consist of a pipe tee connected directly in the exhaust line. The lower opening of the tee can be fitted with a nipple and cap. The cap should be removed periodically and the water allowed to drain out of the tee.

BATTERIES - No batteries are included with the manual or battery charging plants. 12 volt batteries are only furnished with the REMOTE CONTROL AND FULL AUTOMATIC PLANTS. These are to be set on a wood or rubber mat and connected with the cables furnished.

MAIN LINES - Main lines are not included but must be purchased according to the requirements. The wiring method will depend on that already used for the rest of the installation and according to local and national codes.

GROUNDING - The plant must be grounded. This can be done by driving a 1/2" pipe or conduit four or five feet into the ground fairly close to the plant. It is then connected by an approved type ground clamp with a #10 or #12 wire to the battery post or white main line wire at the plant. Do not ground to the plant itself or to any ground used by the radio system. See page 8.



#### PROPER INSTALLATION

A properly installed electric plant for permanent installation should be set up in a well ventilated room of ample size, (at least 10' x 10'). Install plant at least 24" from any wall.

Rubber Shock Absorbing Bushings furnished with the unit should be set under the Plant to reduce vibration. **CAUTION** Shock Absorbing value of rubber bushings will be lost if bolted down too tightly. Plant will stay in place of its own weight.

**CAUTION** - All exhaust connections must be tight, as leakage of exhaust fumes which contain poisonous monoxide gas is **VERY DANGEROUS**. If Plant must be located in basement, install a water trap in the exhaust line or pipe to take care of condensation. Do not run an exhaust pipe further than twenty (20) feet.

#### PROPER VENTILATION

Any engine must have a free circulation of air while operating. Provide at least two openings for ventilation (one for incoming and one for outgoing air).

**DO NOT OPERATE YOUR PLANT IN A CLOSED ROOM AT ANY TIME.**

Openings or ventilators should be at least 18" x 18" with louvers. Cover ventilators or openings with large mesh screen.

If Plant must be located in basement be sure to provide extra cellar openings to take care of air circulation needed by Plant. Basement locations are not recommended because of dampness and poor air circulation. The slight mechanical noise from the unit is also usually objectionable in basement installations. Exhaust connections must be tight and checked often - **EXHAUST GASES ARE POISONOUS.**



UNDERGROUND FUEL TANK - For large fuel storage a large capacity tank may be installed underground. Please check the Underwriters requirements as well as local code before making such an installation.

The tank is to be covered with heavy paint or tar before placing it in a pit which is deep enough so that the tank will be at least two feet or more (according to your local code) below ground level. The bottom of the pit should be solid and the tank packed in tightly so that it cannot shift and break or loosen a connection.

The lift of the fuel to the plant should not be more than 6 feet and the total length of the connecting tubing not more than 10 feet. There should be separate fill and vent pipes and these should be at 1-1/2" in diameter. Extend the vent pipe to the eaves and cap with a screened cap. Coat all joints with litharge or white lead. If tank is not a standard type have all fittings at the tank welded to it.

A length of 1/4" tubing long enough to extend from the top to within three inches of the bottom from the fill opening is soldered to the bottom of a 1/4" tubing inverted nut. This will screw into a 1/8" pipe tap opening in the fill pipe fitting which is purchased for size according to the fill inlet. Cut the lower end of the tubing at an angle. See Page 8.

Use 1/4" tubing from the inverted nut to a fuel shut-off at the plant. Do not use larger tubing. Use the flexible fuel line to connect the shut-off cock to the fuel pump on the plant. Keep all connections tight at all times and check periodically.

UNDERGROUND EXHAUST MUFFLER - An underground muffler can be used to reduce exhaust noises but should not be installed in ground which is continually wet.

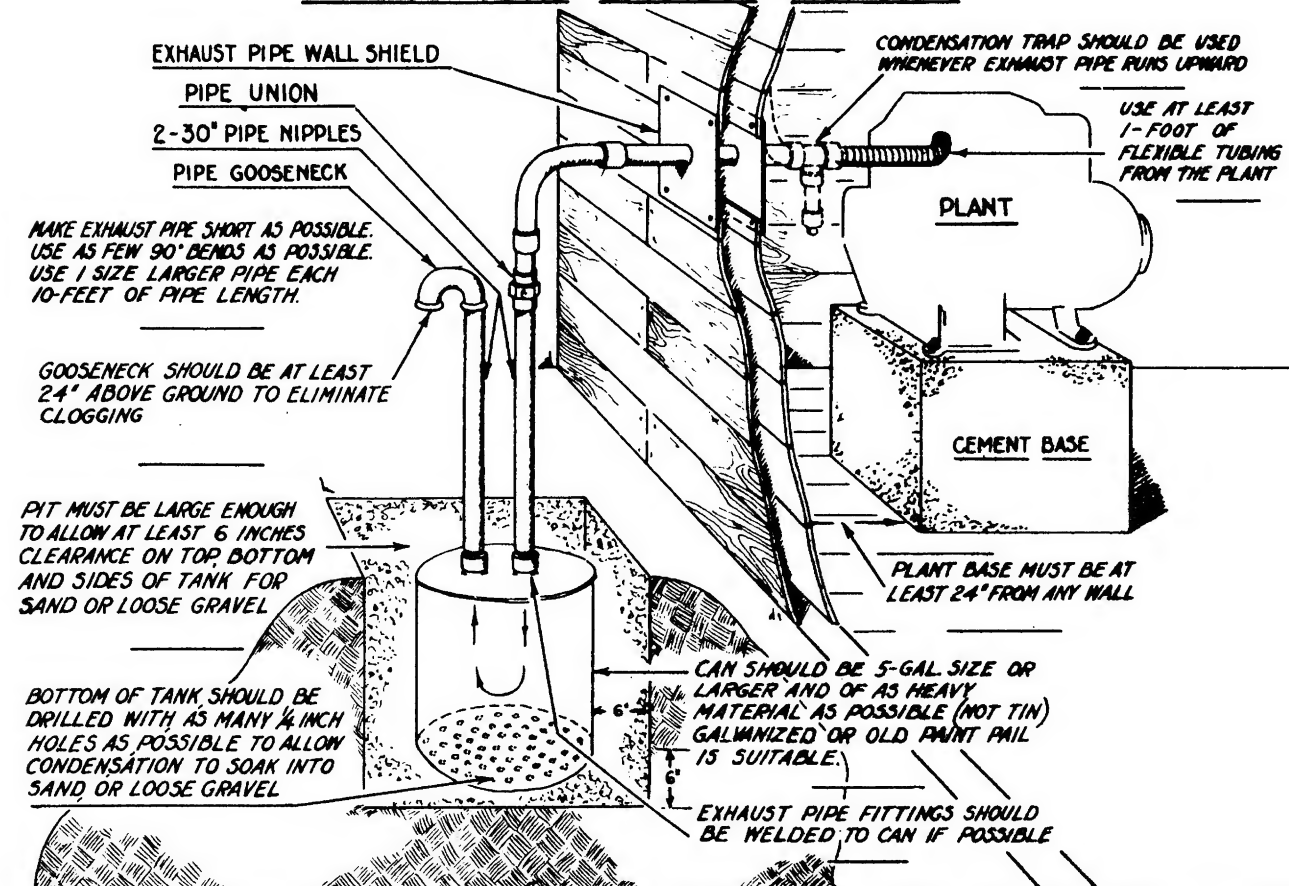
Any heavy tank five gallon capacity or larger may be used. Do not use anything which previously contained gasoline, turpentine or similar liquids as an explosion may result. Remove the bottom or drill it full of holes. Weld 1" or larger fittings for the inlet and outlet connections of the exhaust. See Page 8.

Dig a hole which is at least 6" larger on all sides than the tank. Fill the bottom with loose sand or gravel to permit leakage of the condensation in the tank. Connect the inlet and exhaust pipes to the tank; set it in the pit; and fill the pit with loose sand or gravel.

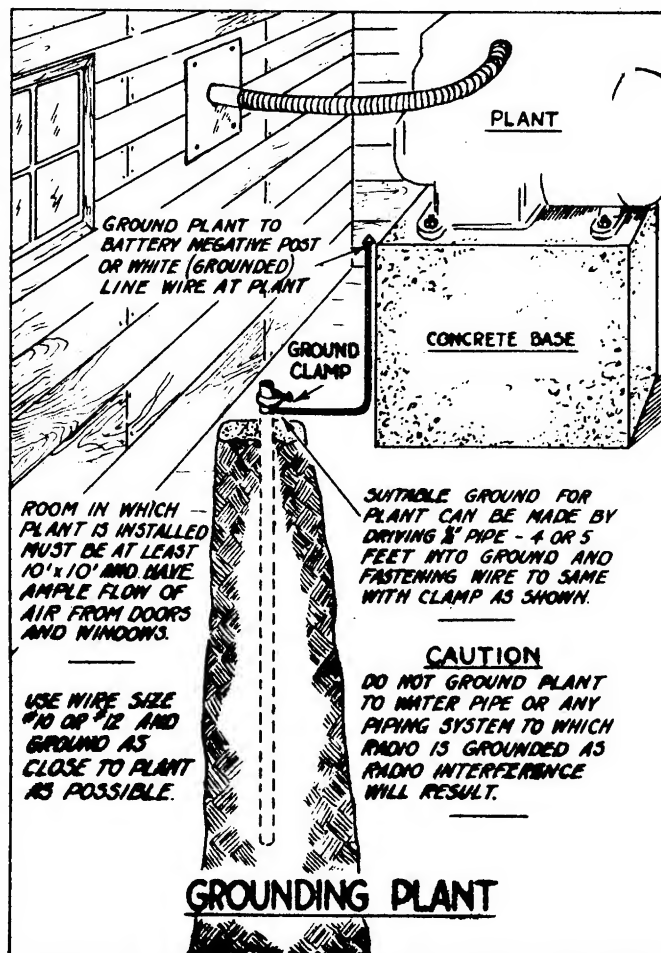
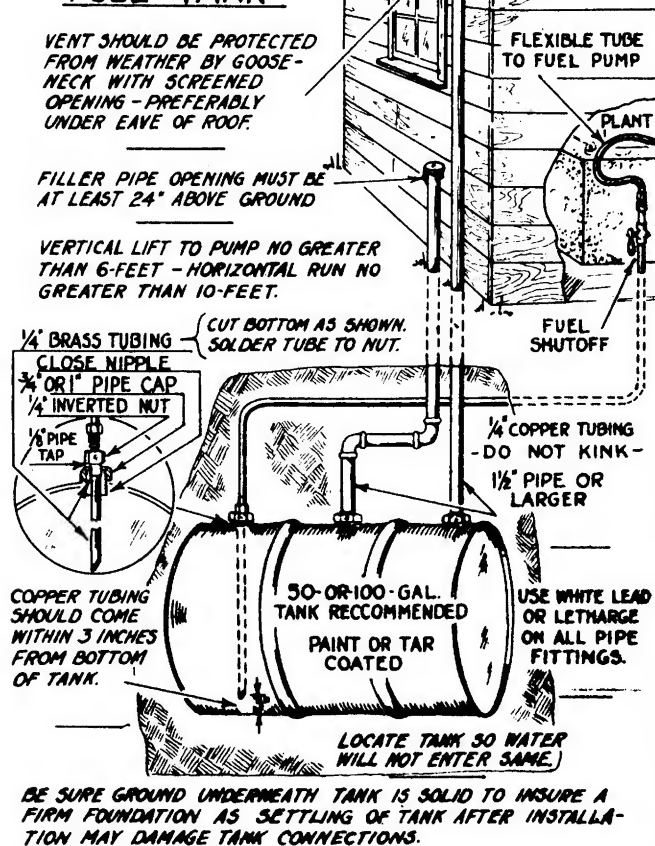
The top of the outside outlet pipe should be capped with a gooseneck and be at least 24" above ground to prevent clogging. The inlet pipe is connected to the plant by running through a hole in the wall and connecting to the flexible exhaust tubing. Be sure to shield the pipe on both sides of the wall as it goes through the opening which is at least 4" in diameter. For every 10 feet of exhaust pipe increase the pipe one size. Use a water trap if pipe rises above exhaust opening on plant.

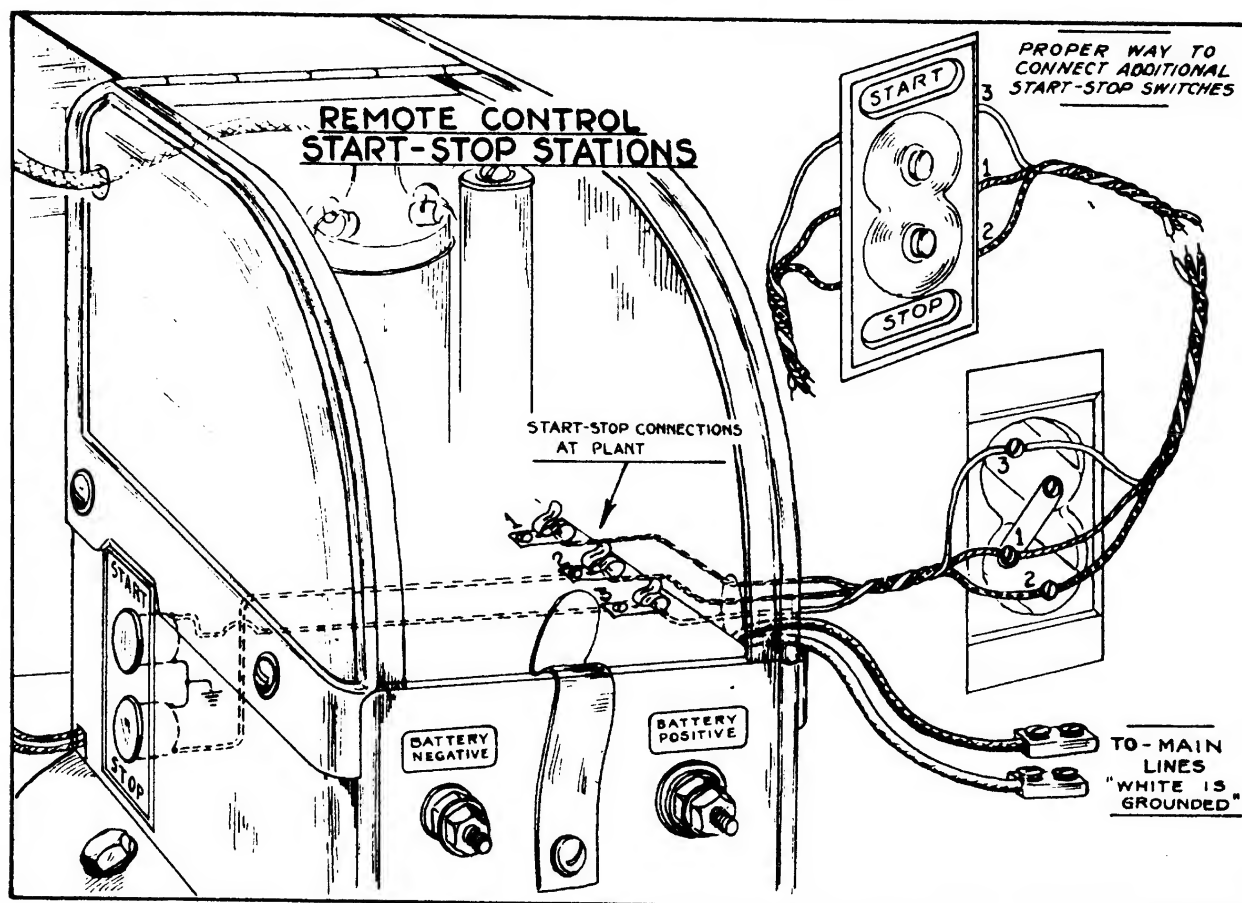
ALL EXHAUST CONNECTIONS MUST BE TIGHT AND FREE FROM LEAKS, particularly in basement installations, as CARBON MONOXIDE FUMES, in the exhaust gases are POISONOUS and extremely dangerous.

## UNDERGROUND EXHAUST MUFFLER



## UNDERGROUND FUEL TANK





INSTALLING THE REMOTE START-STOP CONTROL SYSTEM

The purpose of the Remote Start-Stop Switch is to provide a means of starting and stopping the Plant from any Remote place, providing the distance of the farthest switch from the Plant does not exceed 200 feet, when #19 wire is used. Switches may be installed slightly farther away by using a heavier (Copper) wire.

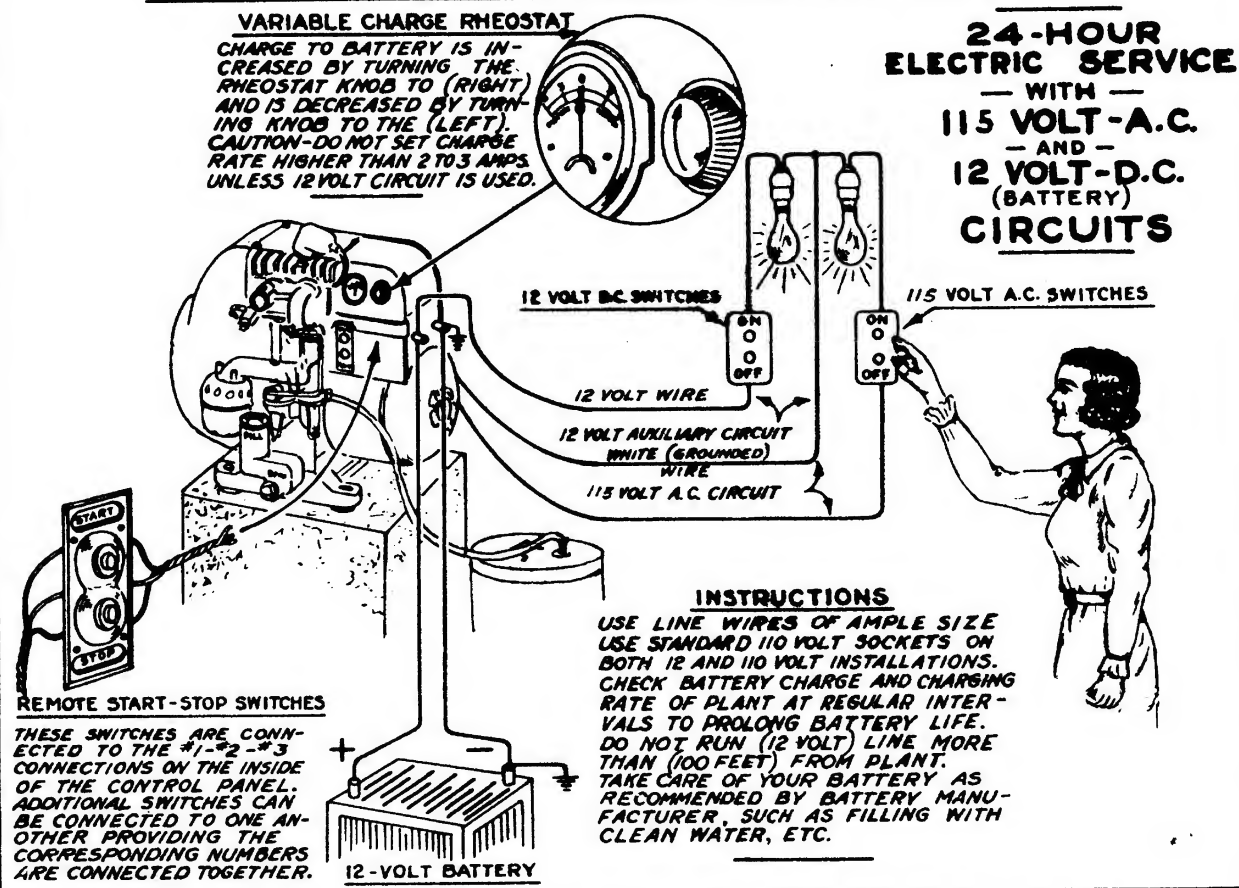
After the Plant has been mounted on its base, the main line wires should be carried through metal conduit (flexible or pipe) to a Fused Switch as shown in the Plant Installation Diagram. It is recommended that the three conductor Start-Stop wire be carried through this same conduit, at least to the main line fuse box. Beyond this point, the Start-Stop wires may be carried to the Remote Switches thru the main line conduit, or run separately, whichever way proves the most practical.

The Remote Start-Stop Switches furnished by the manufacturer have the connections numbered on the back to correspond to the #1 - #2 and #3 connection on the control panel of the Plant. When pushing the Start Button, a circuit is formed between the #1 and #3 connections, and when pushing the Stop Button, the circuit is connected between #1 and #2. It will be noted that the #1 connection is the common or grounded one, and it is very important, therefore, that this wire be connected to the #1 connection on all Remote Switches. It is recommended that this wire be traced out first, either through the use of colored wires or wires marked with a tracer. It is then but a matter of elimination to connect the #3 connection to the #3 connection on all Remote Switches, and likewise all the #2 connections to all #2 terminals. As shown in Figure 10-A, one switch may be connected from another, or directly from the connection on the plant, providing, of course that all #1 connections are in series, #2 connections are in series, and #3 connections are in series.

Be sure all wires are scraped bare, where connections are made and that all screws are tightened securely.

Three conductor Start-Stop wire and additional Start-Stop Switches may be ordered from the manufacturer.

## APPLIES ONLY TO THE ELECTRIC START MODELS



### 12 VOLT D. C. - 115 VOLT A. C. LIGHTING CIRCUITS

The Diagram above shows the proper method of Wiring to provide a 12 Volt D. C., Auxiliary Lighting Circuit in addition to the regular 115 Volt A. C., Circuit. Installation of this Wiring enables you to get (24) Hours Electric Service at the LOWEST POSSIBLE COST. A limited amount of Power for a few lights or a (12) Volt Radio is available at all times whether the Plant is running or not.

All that is necessary to put this 12 Volt service in operation is to run a wire from the battery positive post to a separate switch, lamp, etc. A second wire is connected to a common ground. See illustration. The materials are the same and are connected the same as for the 115 Volt A.C. system. Use a 12 Volt lamp. Observe your local code rules for wiring.

The Generator of the Lighting Plant is constructed to provide up to 10 Amperes charging current to the Starting Battery; A Variable Resistance is mounted on the Control Housing and the Charging Rate can be increased to whatever Rate is found necessary to keep the Battery in a charged condition.

Any room that is wired for 12 Volts should also be wired for 115 Volts, so that the Battery Lights may be turned off when the Plant is running, which will give the Battery time to be re-charged by the Plant. (12) Volt Lines should not be run a distance of more than 100 Feet from the Plant, as there is an appreciable drop or loss of current in a long 12 Volt Line.

To prevent discharging the Battery, if the 12 Volt Battery Lighting Circuit is used, it will be necessary to increase the Charging Rate to (5 or 10 Amperes).

IF THE SEPARATE (12 VOLT CIRCUIT) IS NOT USED, THE RATE MUST BE DECREASED TO 2 OR 3 AMPERES to prevent overcharging the Battery. CAUTION: Check the condition of the battery at regular intervals with a Hydrometer to prevent the possibility of overcharging causing short Battery Life. If the battery tests high, (above 1250 specific gravity), decrease the charging rate slightly. If the battery tests low (below 1200 specific gravity), increase the charging rate.

## OPERATION

**LUBRICATION.**— The use of a good detergent type oil in the engine crankcase greatly increases the life of pistons and rings and we strongly recommend it. Fill the crankcase to the proper level with 2-1/2 quarts of oil of the correct SAE number according to the lowest temperature to which the plant will be exposed, as indicated in the following table.

Lowest Temperature	SAE Number
Above 90°F.	No. 50
Between 40°F. and 90°F.	No. 30
Between 0°F. and 40°F.	No. 10
Below 0°F.	No. 10 or 10W plus 10% kerosene.

Keep the crankcase level at or near the high level as indicated on page 16 at all times, never above it. Too high an oil level will cause the connecting rod to strike the oil and may cause it to foam which interferes with proper lubrication. Too high an oil level may also cause leakage. Change the oil every 100 hours when using unleaded fuels, every 50 hours when using highly leaded fuels or diluted oil.

## CAUTION

If a change is made to detergent oil after using non-detergent oil, allow only 1/3 the normal operating hours before changing oil for each of the next two change periods. Change at the same interval as for non-detergent oil thereafter.

**FUEL.**— Fill the tank nearly full with 68 to 82 octane unleaded gasoline. If necessary to use leaded fuel, refer to the subject USE OF LEADED FUELS near the front of the book.

**AIR CLEANER.**— If the plant is equipped with an oil type air cleaner, remove the cup from the bottom and fill to the level indicated thereon with oil of the same SAE number as used in the engine crankcase.

**GENERAL.**— Place a drop of light oil on each joint of the governor to carburetor linkage.

**COLD TEMPERATURES.**— For cold operating temperatures thoroughly mix 1/2 pint of kerosene with each 2-1/4 quarts of number 10 or 10W oil and pour into the crankcase. Do not add kerosene alone. Start the engine immediately after filling the crankcase with diluted oil and allow to run for 10 minutes to distribute the mixture throughout the crankcase.

**HOT TEMPERATURES.**— Under extremely warm operating temperatures, provide ample ventilation, keep the crankcase oil level near the proper high level, and check the operation oftener.

## MAINTENANCE

It is important that certain inspections and maintenance procedures be made at definite periods to keep the power plant operating continuously and at a maximum level of efficiency. It is recommended that a service log be kept.

DAILY MAINTENANCE.— A daily check of the following points should become a matter of routine.— (1) Crankcase oil level — (2) Fuel supply — Do not fill tank while plant is running.— (3) Keep the plant clean.

WEEKLY MAINTENANCE.— Check each week or after every 50 hours of operation.

OIL.— Check the oil and add whatever oil is necessary to bring the oil to the proper level. If necessary change the oil. When changing oil, run the plant until it is warm. Then drain and refill with new oil. Do not drain the oil when the plant is cold.

AIR CLEANER.— Remove and clean the air cleaner each time the engine oil is changed. Refill with engine oil of the same grade as that used in the crankcase.

FUEL.— Check the strainer either on the fuel pump or tank. Remove bowl and screen and clean both. Replace tightly, and check for leaks.

BATTERIES.— If used, check the water level. Add whatever distilled water is necessary to bring the level to 3/8" above the top of the plates. Do not fill to the top of the battery. Check the charge condition with a hydrometer. If the reading is below 1250 specific gravity increase the charging rate; if above, decrease the charging rate.

MONTHLY MAINTENANCE.— Each month or after 200 hours of operation check the following points in addition to those covered in the regular weekly servicing.

OIL.— Drain the crankcase while the engine is warm. Replace the plug and refill with 2-1/2 quarts of new oil of the proper grade and viscosity.

ANTI-FLICKER BREAKER POINTS.— Remove the breaker cover from the crankcase located behind the air intake of the carburetor. Inspect the points and clean them. Adjust the gap if necessary to .025"

SPARK PLUG.— Remove the cover from the spark plug and the spark plug from the cylinder head. Clean the carbon and reset the plug point gap to .025".

MINOR LUBRICATION.— Place a drop of light lubricating oil on the following places; choke shaft bearing, governor arm ball joint and carburetor link.

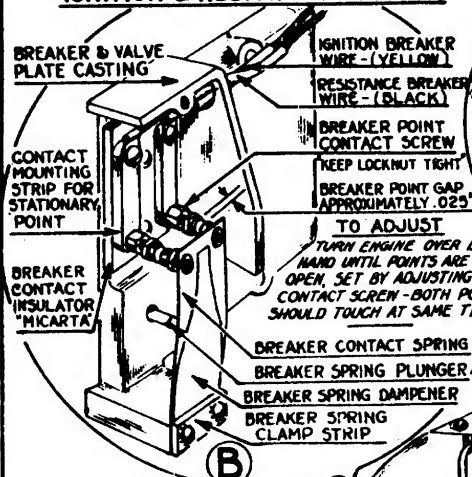
GENERATOR.— Inspect the commutator and collector rings. Clean them if necessary. Check brushes for proper seating and for easy riding in holders. Replace any brushes worn to approximately 5/8" in length.

SIX MONTHS' INSPECTION.— At the end of six months of operation, go over all the weekly and monthly maintenance points. In addition, remove the generator end bell and bearing cover, clean out the old lubricant and fill the bearing housing 1/2 full of new generator bearing lubricant. Pack the grease well into the lower half of the bearing. Replace the cover, using a new gasket if needed. Before tightening the nuts, check the position of the brush spider as indicated by the arrow to make sure that it is in correct position. Avoid getting any dirt whatever into the bearing housing.

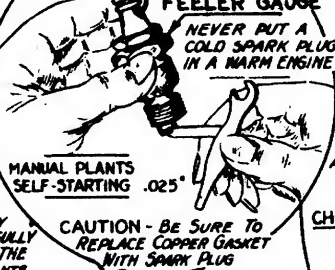


# J-B - ACCESSORY SERVICE SHEET

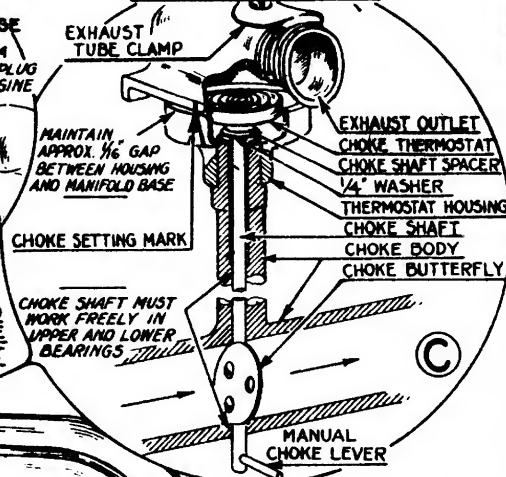
## IGNITION & RESISTANCE BREAKER



## CHECKING SPARK PLUG WITH FEELER GAUGE



## AUTOMATIC CHOKE



## BLOWER HOUSING

## GOVERNOR ARM

## BREATHING TUBE

## CARBURETOR

## AUTOMATIC CHOKE

## MANUAL CHOKE LEVER

## AIR CLEANER

## CHOKE BODY CLAMP

## REMOVE CLEANER FREQUENTLY - RINSE IN KEROSENE OR GASOLINE - DIP IN MEDIUM CRANKCASE OIL - DRAIN FOR 1 TO 2 HOURS AND REPLACE

## OIL FILL AND DRAIN

## OIL LEVEL SHOULD BE KEPT BETWEEN TOP OF FILLER NECK AND CROSS BAR AT BOTTOM - NEVER BELOW BAR

## KEEP CAP TIGHT

## FILL

## DRAIN

## TIGHTEN THIS NUT WITH FINGERS - USE OF PLIERS WILL WARP TOP CASTING

## REMOVE FUEL LINE HERE

## FUEL PUMP

## FLEXIBLE FUEL LINE

## RUBBER MOUNTINGS

## OIL BASE

## FUEL TANK

## FUEL TANK CAP

## AIR VENT

## FUEL TANK TUBE

## OIL AND BATTERY INSTRUCTIONS

## USE GRADE OF OIL SPECIFIED FOR YOUR PLANT

## DRAIN OIL AND REFILL EVERY 100 HOURS

## REMOVE OIL BASE AND CLEAN PUMP SCREEN TWICE A YEAR

## KEEP BATTERY CONNECTIONS TIGHT AND CLEAN

## CHECK WATER LEVEL ONCE EACH WEEK

## TO FILL CARBURETOR

## LIFT MANUAL PUMP HANDLE SEVERAL TIMES

## DO NOT FORCE

## FUEL INSTRUCTIONS

## STRAIN FUEL THRU CHAMOIS TO REMOVE DIRT AND WATER

## DO NOT USE A DIRTY STICK TO MEASURE FUEL

## KEEP AIR VENT OPEN WHILE PLANT IS RUNNING

## KEEP TOP OF FUEL TANK BELOW THE FUEL PUMP LEVEL

## KEEP CAP ON FUEL TANK

## CLEAN SEDIMENT BOWL OFTEN

## KEEP CONNECTIONS TIGHT AND FREE FROM LEAKS

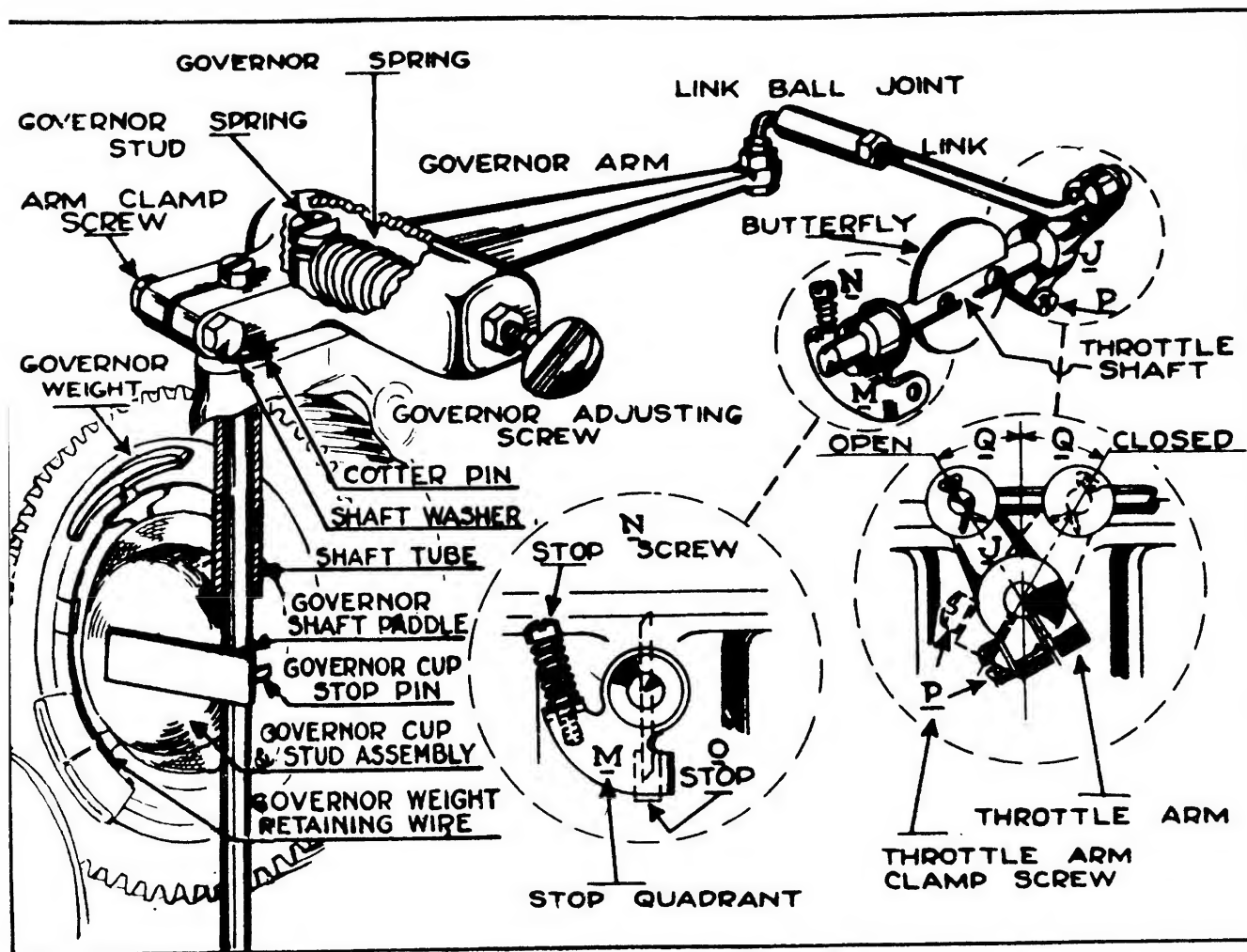
## KEEP PLANT PROPERLY VENTILATED TO PREVENT VAPOR LOCK IN FUEL SYSTEM

## DO NOT KINK FUEL LINE

## - NOTICE -

TO OBTAIN BEST RESULTS AND LONG SERVICE FROM YOUR PLANT, KEEP IT FREE FROM DIRT AT ALL TIMES

USE GRADE OF OIL SPECIFIED FOR YOUR PLANT  
 DRAIN OIL AND REFILL EVERY 100 HOURS  
 REMOVE OIL BASE AND CLEAN PUMP SCREEN TWICE A YEAR  
 KEEP BATTERY CONNECTIONS TIGHT AND CLEAN  
 CHECK WATER LEVEL ONCE EACH WEEK



OPERATION OF GOVERNOR

The purpose of the governor on your plant is to control the speed of the engine under various loads. The Governor is of the mechanical flyweight type, having four weights retained in the camshaft gear inside of the engine. As the speed of the engine picks up after starting, these weights, due to centrifugal force or action, set up a pressure against a governor cup and stud assembly mounted on the timing gear. A governor arm, which is mounted outside of the engine on top of the gearcase, is in turn held in contact with the governor cup and Stud Assembly through a shaft paddle. The governor arm is also connected to the carburetor throttle through a ball joint and link assembly.

Any movement of the governor weights due to a drop or rise in load affecting the engine speed is immediately transmitted to the carburetor throttle, which in turn increases or decreases the butterfly opening, depending on the load. When the load on your plant is increased, more power is needed and a greater opening of the throttle is necessary. With a light load, less power is required to maintain the proper speed of the engine, so the throttle opening is less.

To provide a means of regulating and controlling the action of the governor, a spring is incorporated in the governor arm and an adjustment is made by a thumb screw.

**CAUTION:** THE GOVERNOR ON YOUR PLANT HAS BEEN PROPERLY SET AT THE FACTORY. DO NOT ATTEMPT ANY ADJUSTMENT TO THE GOVERNOR MECHANISM ON THE PLANT WITHOUT FIRST REFERRING TO INSTRUCTIONS COVERED UNDER "ADJUSTMENT OF GOVERNOR".

## GOVERNOR ADJUSTMENT

To readjust the GOVERNOR and check all of its settings, proceed as follows:

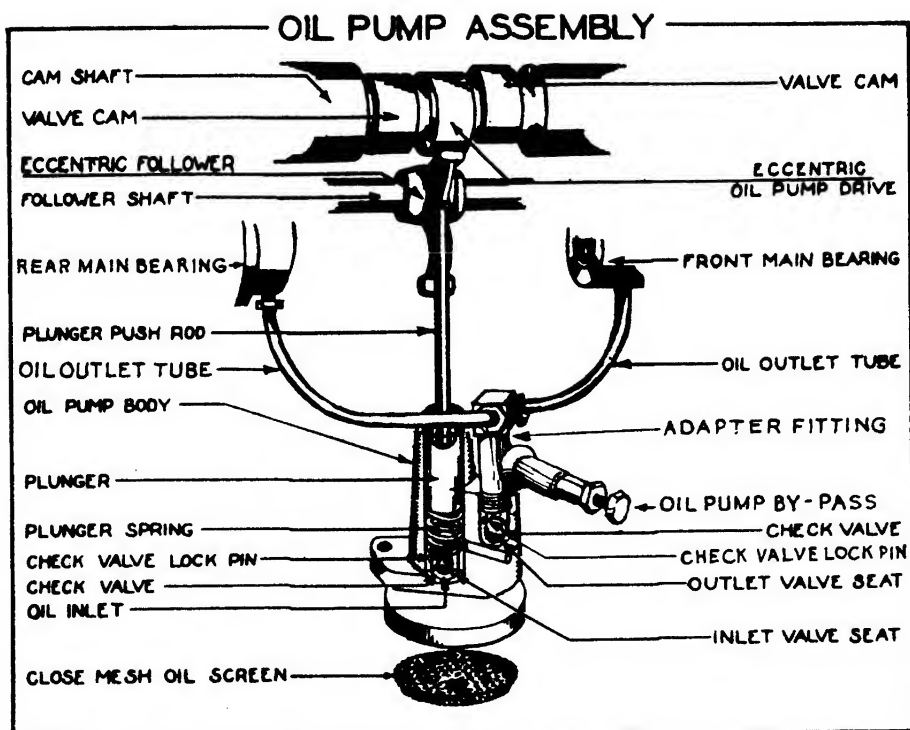
Before making any adjustment on the GOVERNOR ASSEMBLY, move the assembly back and forth several times, noting whether or not the movement is free from any binding or sticking. There should be no friction whatever. The tension of the GOVERNOR SPRING should return the THROTTLE ARM to the OPEN position readily. If there is a tendency for the unit to stick or bind, the trouble may be at the Link Ball Joint, or at the point where the Link passes through the THROTTLE ARM. Loosen the Lock Nut on the Link and move the Link to realign the Ball Joint. The binding may be also caused by the throttle arm rubbing the carburetor body, shaft worn or bent, or butterfly loose.

Recheck the operation of the plant, and if it has not improved, loosen the THROTTLE ARM CLAMP SCREW P and the GOVERNOR ARM CLAMP SCREW. Then hold the Stop Quadrant M against the Stop O and pull the THROTTLE ARM J lightly toward the OPEN position as far as it will go, and tighten THROTTLE ARM CLAMP SCREW P. Now move the Arm to the CLOSED position. The OPEN and CLOSED position of the THROTTLE ARM should be an equal distance Q on each side of a vertical line through the center of the THROTTLE SHAFT. To obtain this setting, loosen the Clamp Screw and slip the THROTTLE ARM from its shaft. Loosen the Lock Nut on the Link and turn the Link in or out of the Ball Joint, to reach the proper setting. Then reinstall the Arm on the THROTTLE SHAFT. Tighten the Clamp Screw with the Arm in the OPEN position and the Quadrant M against the Stop O.

To bring the GOVERNOR PADDLE against the Governor Cup, use a screw driver to turn the Governor Shaft in the direction shown by the arrow below the Governor Arm Clamp. Then, holding the Governor Shaft in this position, proceed to tighten the Governor Arm Clamp Screw Securely, using a good wrench. The Governor adjustment should now be correct. Recheck the operation after the plant has reached its normal operating temperature.

The Governor Adjusting Screw serves only to regulate the speed range of the Governor. Turning the Screw to the right (in) increases the speed and voltage output of the plant. Turning the Screw to the left (out) decreases the speed and voltage. Be sure, after adjusting that the Locknut on the screw is tightened securely. The Spring must be seated on the Governor Spring Stud, and the Coil of the Spring seating in the grooves of the Stud. The other end of the Spring must be slipped over the Governor Adjusting Screw.

NEVER USE ANY SPRING EXCEPT THAT SUPPLIED BY THE PLANT MANUFACTURER.



### OIL PUMP OPERATION AND SERVICE

The sturdy plunger type pump, driven by an eccentric on the camshaft, supplies oil under pressure to the crankshaft bearings and the connecting rod bearings. From these points, oil sprays to the other internal parts of the engine requiring lubrication.

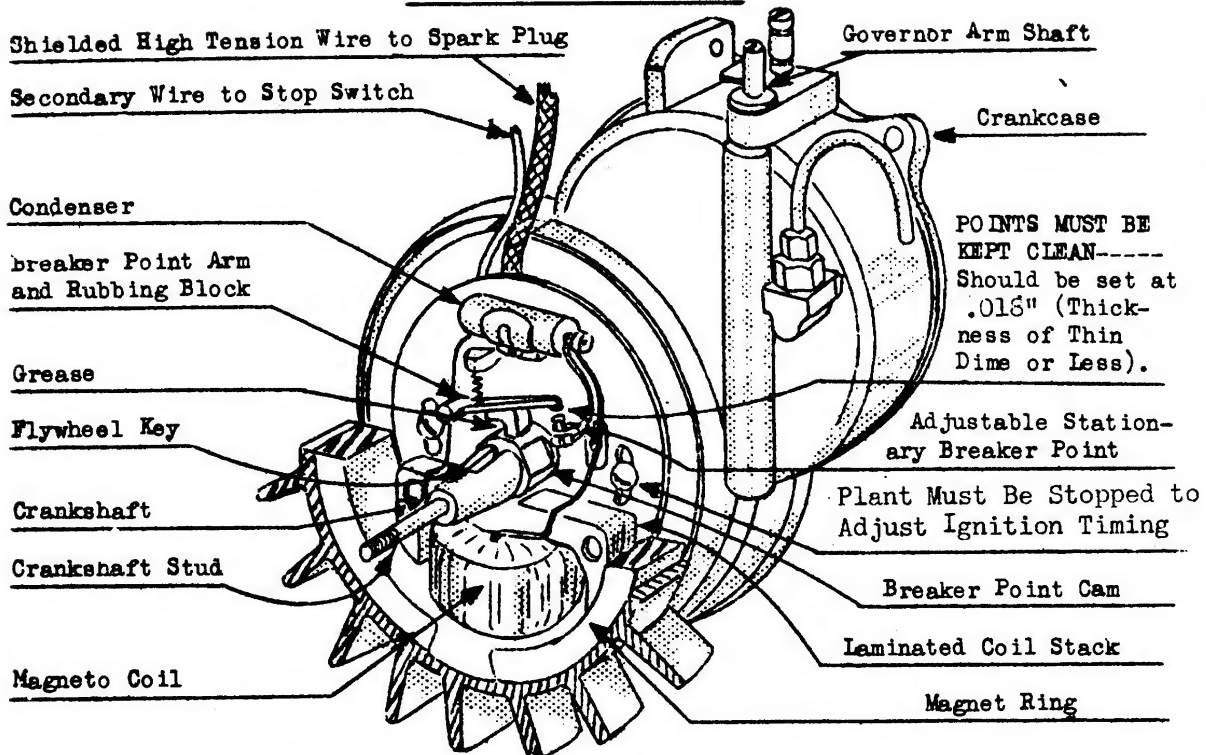
The pump is partially submerged in the crankcase oil and oil flows into the pump through a fine mesh screen. The oil passes through the inlet and outlet valves of the pump and to an adapter fitting which distributes it to two tubes connected to the two main crankshaft bearings. Drilled passages through the crankshaft carry oil from crankshaft bearings to the connecting rod bearing.

A by-pass valve on the side of the adapter fitting is adjusted to permit excess oil to return directly to crankcase when pressure exceeds 25 lbs. Ordinarily, the factory adjustment of the by-pass valve should not be changed. If the adjusting screw must be removed for any reason, the original adjustment should be noted so that it may be properly reset.

Since oils will form sludge, the pump and screen should be removed at least twice yearly and washed thoroughly in gasoline. After draining well, hold the pump about half under surface of a pan of oil and work plunger by hand until oil flows freely from outlet. Clean oil base thoroughly with gasoline.

The oil level on the electric start models should be kept near the top of the oil filler neck. Never allow the level to drop below the cross bar in the oil filler neck. The oil level on the manual start models should be kept at the bottom of the threads in the oil fill hole. Never allow the level to drop over one inch below the threads. Use a correct grade of oil. Check the Lubrication page.

# MAGNETO



Internal Parts of Magneto shown in Sketch are reached by first removing Blower Housing at Front of Engine. Flywheel is then removed by loosening the Hex. Nut holding it to Crankshaft. Turn Nut back Two or Three full turns, and while pulling forward on Flywheel with one hand, strike Nut sharply several times with hammer. When Wheel has loosened, turn Nut off and remove Wheel.

**ADJUSTING BREAKER POINTS** - Breaker Points should be set with .018" Gap. Contact faces should be SMOOTH and FREE of OIL, as this causes Rapid Contact Wear and Missing of Engine. Proper Point Gap is obtained by loosening the two Screws in the Stationary Breaker Point Bracket, and sliding it up or down until Proper Clearance is obtained. When Breaker Arm Rubbing Block is worn so that adjustment is no longer possible, a new Breaker Arm should be installed. It is desirable to check Breaker Point

Tension which is measured by connecting a Spring Tension Gauge to the Point on the Breaker Arm, and pulling it until Point barely opens, then taking the reading from the Gauge. Correct Tension should be 23 ounces, or approximately 1-1/2 pounds. Whenever Points are adjusted, Breaker Arm Rubbing Block and Crankshaft Cam should be Greased with a Special Grease of the Sta-put variety, that will not sling off. This Special Grease may be obtained from the factory.

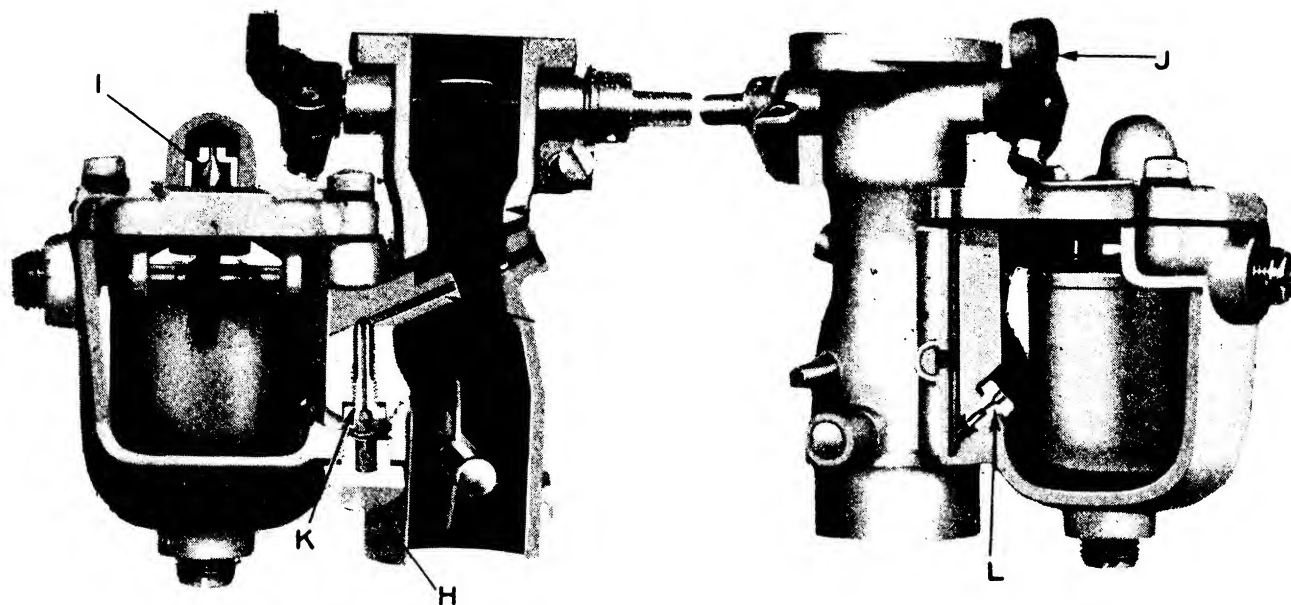
**HARD STARTING** - This may be caused by a Wide Gap or collection of a Lead Compound on the Spark Plug Electrodes, from use of Ethyl Gasoline. This Lead deposit acts as an Insulation, and higher than normal voltage is required to jump Spark Plug Gap. Clean and Set Spark Plug Points. Hard Starting is caused by Too Heavy Oil, preventing engine from being cranked at a high enough speed to obtain good Spark. (See "Oiling").

**WEAK SPARK** - Magneto Spark can be checked by removing the High Tension Wire from the Plug and holding Terminal about 3/16" from a Metal part on Engine while someone pulls Engine over with Rope Starter. Weak or Short Spark may be caused by a Short Circuit on Stop Line, Incorrect Breaker Point Gap, Leaky Condenser or a Defective Coil.

**NO SPARK** - Causes of Failure of Magneto to produce any Spark are: Shorted Condenser, Breaker Points not opening, Primary Wiring grounded or shorted, or a Breakdown of Insulation in High Tension side of Coil. Trouble of this kind requires replacement of Defective Unit.

## CARBURETOR SERVICE

This engine is equipped with a Zenith carburetor, Model TR20. Little care or attention need be given the carburetor other than periodic cleaning. The jets are of a fixed size for best performance and economy of operation, but are removeable for cleaning or replacement. If foreign material gets through the gas filter bowl and screen and into the carburetor it may become lodged in the tiny holes of the jets. This would cause hard starting, loss of power and irregular operation.



To clean the carburetor, remove the carburetor from the engine. Remove the throttle arm "J" from its shaft, after which the bowl cover may be removed to reach the compensating jet "L". Be very careful not to bend or damage the float when removing or replacing the bowl cover.

A hexagon head plug "H" at the lower side of the bowl must be removed to gain access to the main jet "K". Use a screwdriver of the proper size to remove the jets so as not to burr or distort them. Never use a wire or a needle to clean the hole in a jet, for enlargement of the hole may result. Blow compressed air through the jet holes, and through the fuel inlet valve "I". Remove any sediment from the bowl that may have accumulated. Blow compressed air through the passages.

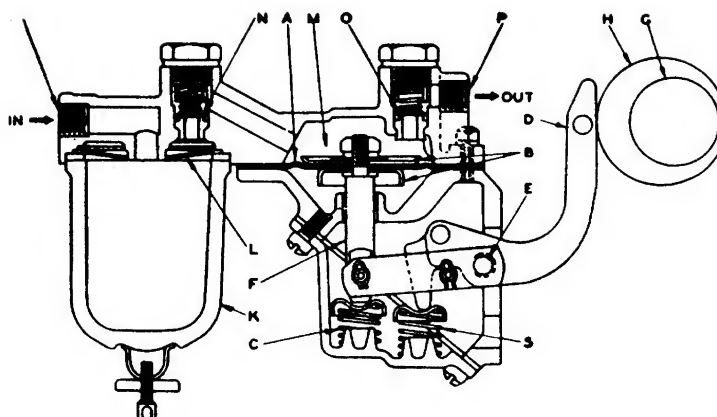
Reassemble the carburetor, being sure that the small fibre gaskets is in place under the head of each jet.

Assemble the carburetor to the manifold, using a new gasket. Connect the gas line to the carburetor, using care not to cross or strip the threads of the gas line fittings. Tighten the nut holding the manifold to the cylinder.



## ACCESSORY SERVICE

### FUEL PUMP



OPERATION.— By revolving shaft (G) the eccentric (H) will lift rocker arm (D) which is pivoted at (E) and which pulls the pull rod (F) together with diaphragm (A) held between metal discs (B) downward against spring pressure (C) thus creating a vacuum in pump chamber (M). Fuel from the rear tank will enter at (J) into sediment bowl (K) and through strainer (L) and suction valve (N) into pump chamber (M). On the return stroke, spring pressure (C) pushes diaphragm (A) upward forcing fuel from chamber (M) through pressure valve (O) and opening (P) into the carburetor. When the carburetor bowl is filled the float in the float chamber will shut off the inlet needle valve, thus creating a pressure in pump chamber (M). This pressure will hold diaphragm (A) downward against the spring pressure (C) where it will remain inoperative until the carburetor requires further fuel and the needle valve opens. Spring (S) is merely for the purpose of keeping rocker arm (D) in constant contact with eccentric (H) to eliminate noise.

SERVICE DIAGNOSIS.— LACK OF FUEL AT THE CARBURTOR — CAUSE AND REMEDY.

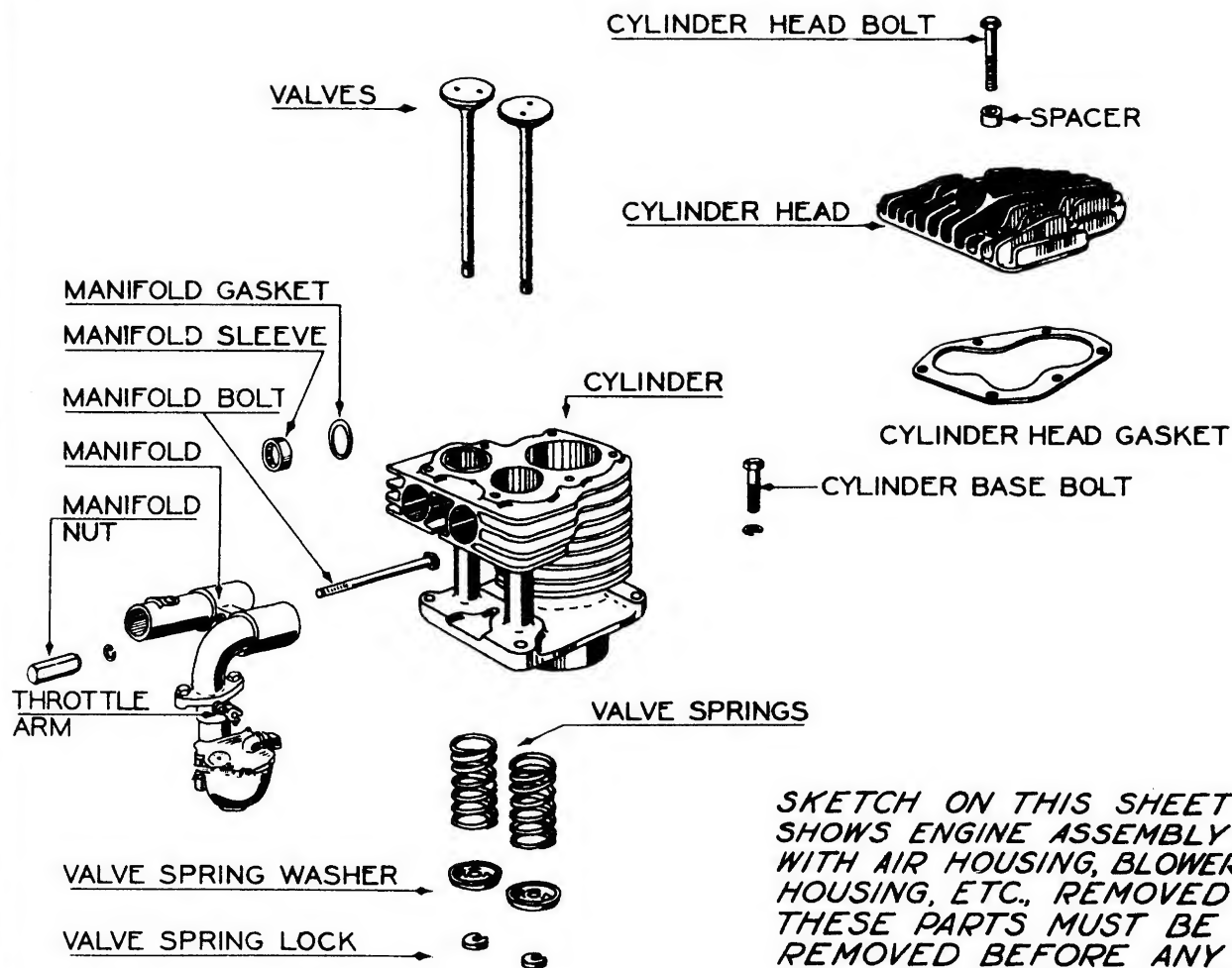
- (A) Fuel tank empty. — Refill.
- (B) Leaky tubing or connection. Replace the tubing and tighten all the connections.
- (C) Bent or kinked tubing.— Replace the tubing.
- (D) Filter bowl loose — Tighten the thumb nut, making certain that the cork gasket lies flat in its seat and is not broken.
- (E) Dirty screen.— Clean the screen. Make certain that the cork gasket is properly seated when reassembling.
- (F) Loose valve plug. — Tighten the valve plug securely, replacing the valve plug gasket if necessary.
- (G) Dirty or warped valves. — Remove the valve plug and the valves. Wash the valves in kerosene. Examine the valve seat to make certain there are no irregularities which prevent proper seating of the valves. If the valves are warped or damaged, replace them. Place the valve in the valve chamber. Reassemble the valve plug and spring, making certain that the spring is around the lower stem of the valve plug properly. Use a new gasket under the valve plug if necessary.

FUEL LEAKAGE THROUGH THE VENT HOLE IN THE BODY.

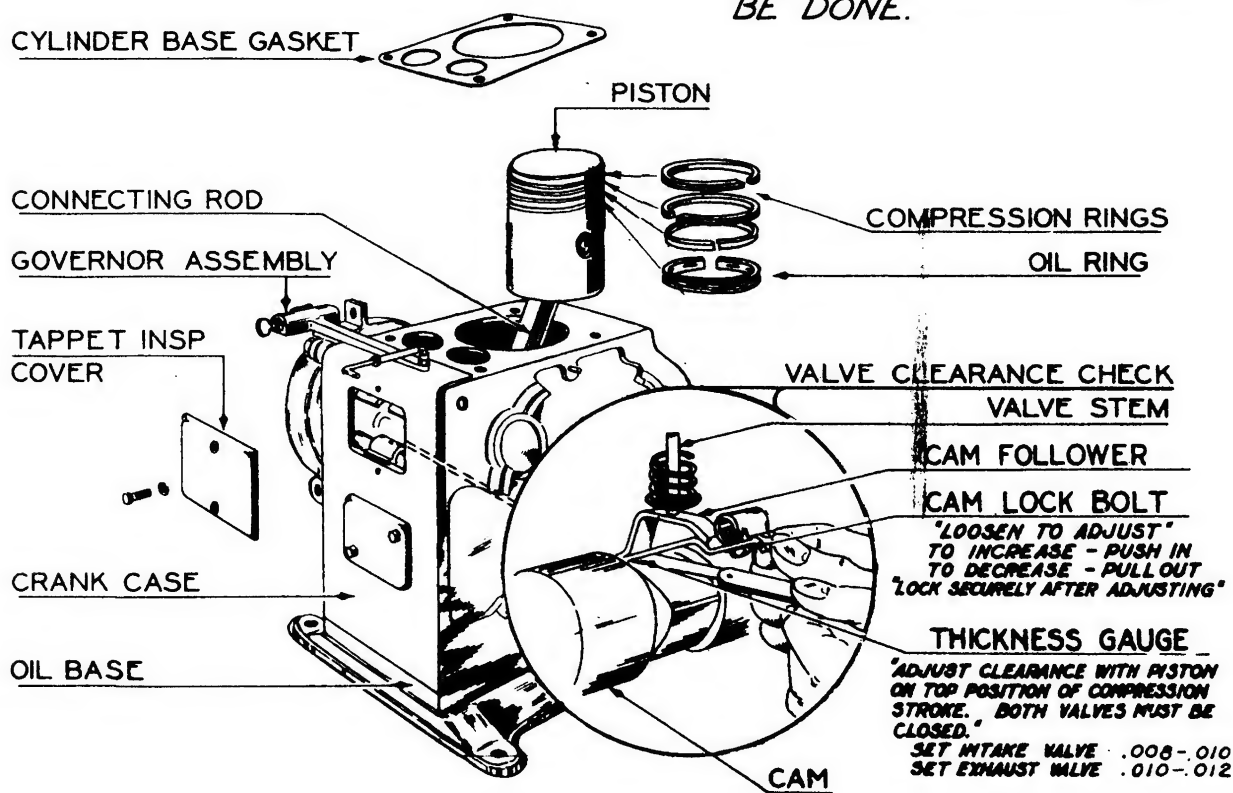
- (A) Worn or punctured diaphragm. — Replace the diaphragm.
- (B) Loose diaphragm nut or defective pull rod gasket. — Tighten or replace.

FLOODING OF THE CARBURTOR.

- (A) Carburetor needle valve not seating.— Check carburetor for proper adjustment.



SKETCH ON THIS SHEET SHOWS ENGINE ASSEMBLY WITH AIR HOUSING, BLOWER HOUSING, ETC., REMOVED THESE PARTS MUST BE REMOVED BEFORE ANY CYLINDER SERVICING CAN BE DONE.



## YEARLY ENGINE SERVICING

Once each year, if the plant is used under normal conditions, the accumulated hours of operation will total 2500 or more. After that much service, 2500 to 3000 hours, the engine should be given a thorough going-over, including inspection of pistons, piston rings, valves, crankcase, etc.

One of the most frequent service operations on any gasoline engine is valve grinding. This and the removal of carbon will add service and power to the engine.

BE SURE TO DISCONNECT BATTERY FROM PLANT BEFORE DOING ANY SERVICE WORK ON ENGINE.

Have the following parts on hand before attempting to grind valves. Refer to the sheet on valve and cylinder service page 18.

- |                                 |                                  |
|---------------------------------|----------------------------------|
| 1 cylinder head gasket          | 1 complete set of piston rings   |
| 1 cylinder base gasket          | The following is also suggested: |
| 1 valve inspection plate gasket | 1 complete set of valves, valve  |
| 2 manifold gaskets              | springs, locks and washers.      |
| 2 manifold sleeves.             |                                  |

ENGINE DISASSEMBLY - To correctly service the engine it is best to remove all external parts at the cylinder and then proceed to disassembly the engine. See page 21.

1. Remove the blower air housing and metal plate over the cylinder head.
2. Remove the spark plug shield and disconnect the ignition wire.
3. Disconnect the fuel line from the carburetor.
4. Disconnect governor link from carburetor by removing nut holding the ball joint.
5. Disconnect the breather line between gearcase and air intake casting.
6. Loosen the hexagon nut and remove the intake and exhaust manifold with the carburetor, choke and air cleaner assemblies.
7. Loosen and remove the bolts holding the cylinder head and remove the head.
8. Loosen the four bolts holding the cylinder to the base and remove the cylinder. This may be done by prying it away from the crankcase.

When removing the cylinder, be very careful how the piston is handled as it will tend to fall to one side and may be damaged. Then examine the rings and piston. The rings should be removed from the piston and the grooves and oil holes cleaned. It is best to fit the piston with new rings as they are inexpensive, the job can be easily done at this time, and it may save another service job in the immediate future. If the old rings are in good shape, they may be replaced. When this is done wrap the piston in old cloth to prevent any damage while the other parts are serviced.

The valve and valve stems and guides should next be checked. Turn the cylinder upside down and place on a clean surface. Press down on the valve springs and remove the retainers. Then after turning over the cylinder again, the valves and springs may be removed. Clean the valve stems and heads with a scraper and wire brush.

The stems must be free of carbon and slide freely in the valve guides of the cylinder. If they stick, after being cleaned, the guides should be cleaned with an expansion reamer or with a valve guide cleaning tool before attempting to reseat the valves. The valves should have at least .004" to .005" clearances between the guides and stems. If the stems are worn or bent, replace the valves.

Wipe the valve face, stem and seat clean with a cloth. Place a light coiled spring on the valve and insert in the cylinder. Apply a thin coat of medium grinding compound to the face. With a light pressure rotate it back and forth in the seat. It is best to have a valve grinder for this purpose. While oscillating the valve in the seat raise it every so often and then force it down gently. Then remove the valve. Clean the face and seat and inspect them both. There should be a bright silvery band of uniform width all around both. The width of the band will be from  $3/64$  to  $1/16$  inches. If the band is not as stated, repeat the grinding process. Replace the grinding compound often and wash off with water.

Clean the valve and seat and remove the grinding spring. Re-insert the valve and replace the main spring and retainer. Check the spring and if it is weak or broken, replace with a new one.

Now inspect the cylinder head. Remove the spark plug. Clean the carbon of the plug and adjust the gap to .025". Clean all carbon out of the head by scraping if necessary. Replace the spark plug and thoroughly wash both head and plug.

Have all of the gaskets ready for the cylinder assembly. Cover the piston, rings, and cylinder walls freely with clean engine oil. Then replace the cylinder and head. Be careful in handling the piston and rings. The openings of the rings are to be spaced so that no opening is above the other one. Reassemble the parts in the reverse order as indicated on the following page.

TAPPETS - Remove the tappet inspection and breaker point cover behind the carburetor. When the valve is down and the port closed, the clearance on the intake valve should be .008" to .010" and on the exhaust valve .010" to .012". This is checked by slipping a feeler gauge between the cam follower and shaft below each valve stem.

Pulling the cam lever out decreases the clearance while pushing it in increases the clearance. Replace the inspection cover gasket if necessary. After several hours of operation remove the cover and recheck the valve clearances.

BREAKER POINTS - The breaker points mounted on the tappet inspection cover should be checked. They can be cleaned by filing. Any oil on the assembly should be removed and the gap set to .025".

CARBURETOR - The gasket between the intake manifold and carburetor should be replaced and the screws tightened. When replacing the gasket, inspect the carburetor. Remove any sediment or dirt that has accumulated in the bowl. Tighten the nut holding the manifold to the cylinder.

RUNNING - When a reconditioned plant is first started, little or no load should be connected during the first several hours of operation. This will allow the new and reconditioned parts to wear in without excessive wear and will prolong their life.

GOVERNOR - After the governor link is reconnected it may be necessary to readjust it. Check page 14 if any such adjustment is necessary. In the main this will be indicated by the lights being too dim or too bright and the equipment not operating satisfactorily.

CONTROL PANEL - Plants having control panels should have all of the electrical contacts and connections in the panel checked. All of the connections are to be clean and tight. The contacts on the relays must be cleaned and filed if necessary to remove any pitting or rough spots. Be sure the battery is not connected when making this service.

GENERATOR - All dirt, oil and grease is to be removed. The bearing is to be regreased as explained under "Six Months Servicing". Clean the commutator and collector rings. Check the brushes to see that they make good contact and ride easily in the holders. Replace the brushes if necessary.

## MAJOR ENGINE OVERHAUL

After long periods of operation (1 to 5 years or more) a major overhaul of the engine and generator may become necessary. This should not be considered as essential unless operation of the plant has become inefficient, or unless serious noises develop within the engine an indication of loose main or connecting rod bearings, timing gears, piston pins, wrist pins, or other working parts of the engine.

CRANKCASE INSPECTION.- To complete a thorough inspection of the crankcase, the case should be drained of oil and the oil base removed. By placing a trouble lamp inside the crankcase, it is possible to inspect all the working parts, or by feeling the fit of the connecting rods on their bearings, and the fit of other internal working parts, it will be possible to determine whether it is necessary to consider a major overhaul.

An overhaul of this plant should not be attempted by anyone who is not entirely familiar with the operation of modern internal combustion type engine. The dismantling of the engine and generator will follow a natural course, and a careful observance of these parts, as they are removed from the plant, will indicate which of them must be replaced, which can be repaired, and which must be adjusted. It is necessary to remove the oil base from the plant to accomplish a major overhaul.

Worn or scored pistons, pins, and rings must be replaced. The cylinders can be honed or bored to oversize diameter, and larger pistons can be furnished by the factory. The cylinders can be returned to the factory and honed to size. All work should be done by a competent shop, properly equipped.

The connecting rod can be adjusted if necessary, by carefully filing or dressing the connecting rod cap, to reduce the clearance between the connecting rod bearing on the crankshaft.

BEARINGS.- The main bearings and camshaft bearings of the engine are steel-backed and babbitt-lined. The front main bearing is pressed into the bearing plate. The rear main bearing and the camshaft bearings are pressed into the crankcase. These bearings are line reamed after installation. If replacement becomes necessary, it is advisable to send the crankcase and bearing plate to the manufacturer for servicing. If this is not convenient, the bearings may be installed by use of an arbor press. Never fit bearings so tightly that the engine cannot be turned over easily by hand. All clearances must be running fits. Bearings must be line reamed after installing. See the table of clearances.

OIL SEALS.- The rear main bearing oil seal is a leather unit and sheet metal member pressed into the rear main bearing casting. This seal must be replaced whenever a major overhaul is made, or whenever oil leakage occurs from the rear bearing, evidenced by oil being thrown from the ventilating openings between the engine crankcase and generator frame.

Care should be taken when installing this seal to be sure that the lip of the leather is not damaged by the keyway in the shaft. Grease the shaft carefully before slipping the seal over the shaft. Tap the seal into the bearing cap evenly and shellac the surface after the seal is installed.

The oil seal in the front gearcase cover is a cork synthetic member cemented into the casting. Replace the seal during each major overhaul or whenever leakage occurs and oil is thrown from the crankshaft flywheel blower.

## **CAUTION**

When replacing the crankshaft stud, be sure to tighten it so that it cannot come loose, or equal to 40 lbs. pressure when using a torque wrench.

TIMING GEARS - A textolite gear is pressed on the crankshaft and held in place by a large washer and hexagon nut. It meshes with a cast iron gear which is also keyed but is on the camshaft. There should be a clearance of from .003" to .005" between the two gears.

Ordinarily the crankshaft gear should not be replaced. If it becomes necessary as indicated by extreme noisiness of the gear assembly, remove the blower housing magneto flywheel and the gearcase. It will be necessary to drain the engine oil before removing the gearcase. The gear will then be visible and the retaining nut and washer are to be removed. When replacing with a new gear be sure the timing marks on both camshaft and crankshaft are lined up to insure correct timing of the camshaft.

GASKETS - Whenever any major work is done on the engine, be sure to install new gaskets wherever they have been disturbed.

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THE FOLLOWING IS A TABLE OF CLEARANCES FOR BEARINGS AND OTHER PARTS OF THE ENGINE.

	<u>MINIMUM</u> <u>INCHES</u>	<u>MAXIMUM</u> <u>INCHES</u>
Valve tappet clearance (intake) at 72°F.	.008"	.010"
Valve tappet clearance (exhaust) at 72°F.	.010"	.012"
Valve seat width (all)	3/64"	5/64"
Valve stem clearance in guide (all)	.002"	.0035"
Crankshaft main bearing (clearance)	.0015"	.003"
Crankshaft (end play)	.006"	.008"
Connecting rod bearing (diameter)	.0015"	.0025"
Connecting rod bearing (end play)	.004"	.006"
Timing gear (backlash)	.003"	.005"
Piston (cylinder clearance)	.007"	.0075"
Piston pin (in piston) at 72°F.	Hand Push Fit	
Piston pin (in rod)	.0002"	.0003"
Piston ring gap (in cylinder)	.008"	.015"
Camshaft main bearings (diameter)	.0015"	.0025"
Spark plug (points)	.024"	.026"
Magneto breaker (points)	.018"	.022"
Anti-Flicker breaker (points)	.023"	.025"

Tighten cylinder head nuts to 18-20 ft. lbs. torque.

Tighten connecting rod bolts to 18-20 ft. lbs. torque.

Tighten flywheel nut to 35-40 ft. lbs. torque.



## GENERATOR

The generator is a 115 volt, 60 cycle, alternating current, self-excited type with four poles. The revolving armature has both alternating current and direct current windings on a single stack of laminations. A direct current commutator and alternating current collector rings are mounted on the armature shaft. Four heavy direct current field coils are mounted on four laminated pole pieces, which are in turn bolted to the inside of the generator frame. The brush rig assembly is held in place with screws to the outer end of the generator frame and carries both alternating current and direct current brushes.

CARE OF GENERATOR - To obtain maximum efficiency keep the generator and all its parts clean. Remove all oil, dirt and grime. Keep the commutator and collector rings clean and free from dirt. Check the brushes periodically to see that they make good contact and ride easily in the holders. Keep all connections tight.

COLLECTOR RINGS - The collector rings are the two solid rings at the end of the armature. The brushes riding on these rings collect the alternating current collected and provide the connection to the wiring system.

Clean the rings with a dry cloth if they are oily. To remove ridges or flat spots which may be caused by brushes sticking in the holders and to smooth out the rings hold a strip of 00 sandpaper against the rings while the plant is running. Then wipe them with a clean cloth.

COMMUTATOR - The commutator is made up of copper segments each of which is separated and insulated from each other by strips of mica. This built up into a large ring and mounted on the armature behind the collector rings. Brushes riding on the commutator convey the direct current generated.

NEVER USE OIL OR GREASE ON THE COMMUTATOR. NEVER USE EMERY CLOTH OR PAPER TO DRESS THE COMMUTATOR.

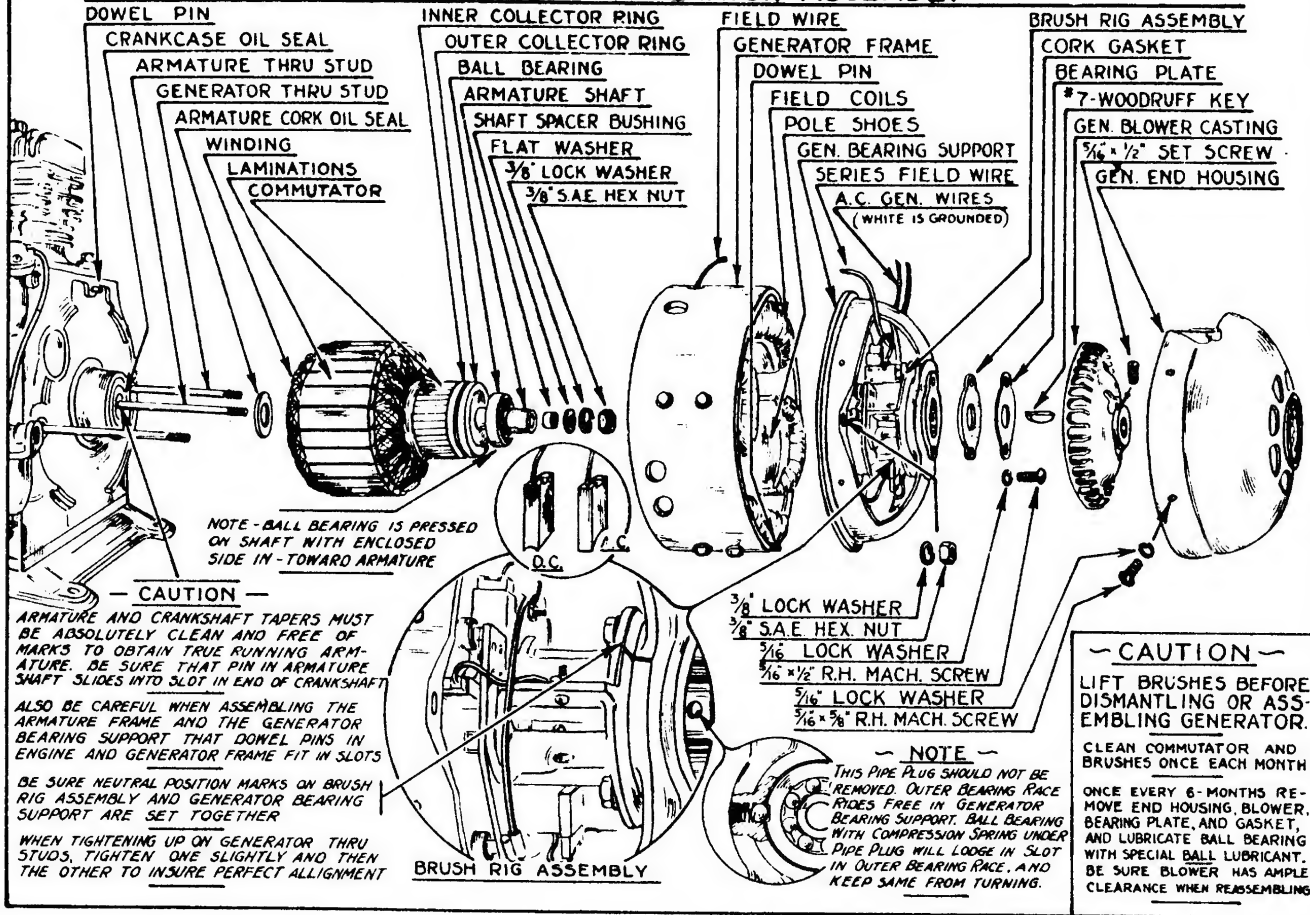
Clean the commutator of oil and grease by using a clean lint free cloth. If the commutator is gummy, clean with a cloth dipped in kerosene. There is no danger of shock when doing this if the plant is properly grounded as previously explained.

Under proper conditions, the commutator takes on a mahogany colored finish which is highly desirable for satisfactory operation. When the commutator has been burned or pitted by arcing brushes caused by dirt or sticking, a strip of 00 sandpaper may be used to dress it. See Page 23.

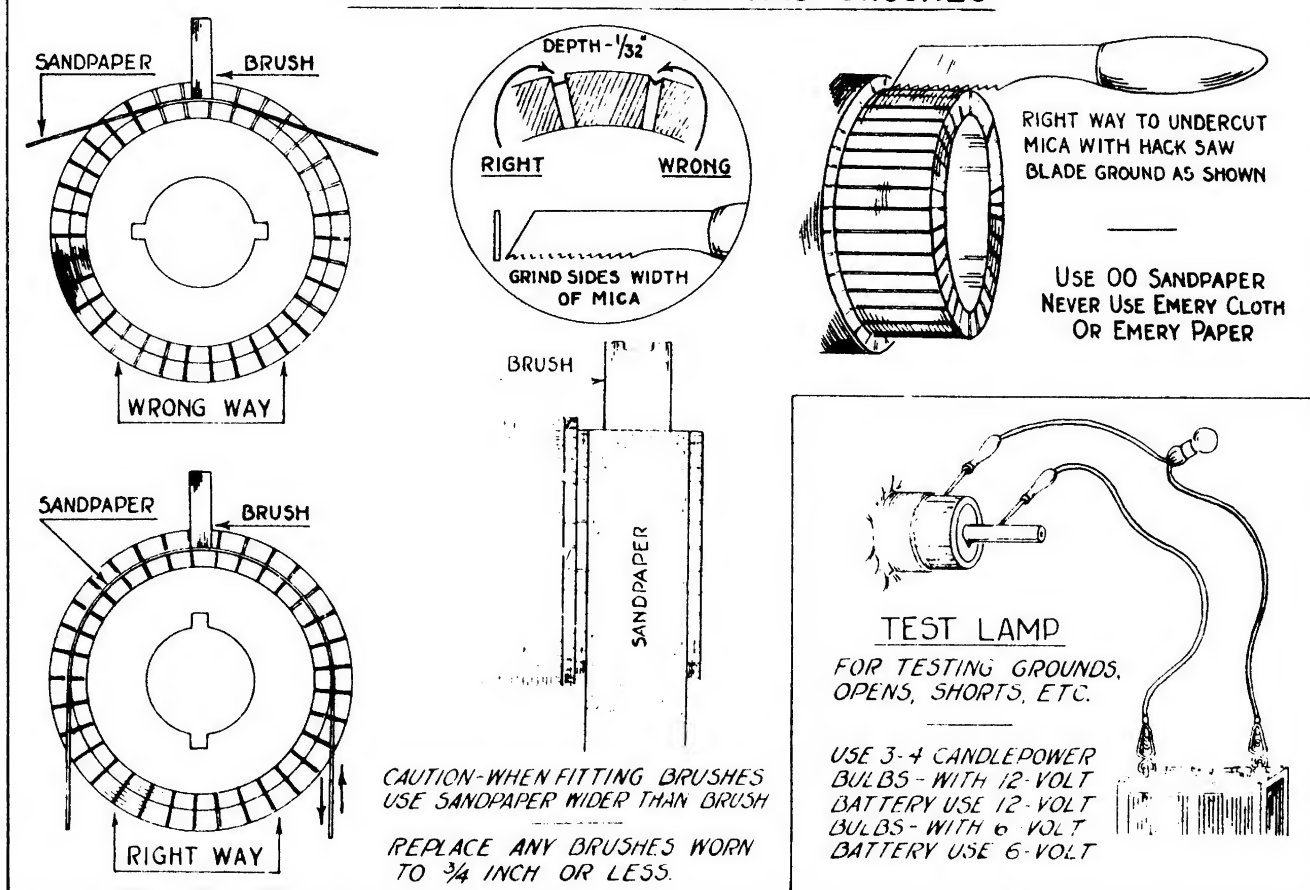
When new, the mica insulation between the copper bars is cut down about  $1/32$ " below the surface of the bars. In time, the surface of the bars will wear down to the level of the mica. As the mica is harder than the copper it will form ridges which cause the brushes to jump and prevent them from making good contact. The mica should be undercut whenever it is even with or higher than the bars. See Page 28.

After long service, the commutator and collector rings may wear eccentric, or become badly burned, due to neglect. In such a case, the armature should be removed and the commutator and collector rings turned in the lathe. It will be necessary to undercut the commutator after turning.

# 13 ALTERNATING CURRENT GENERATOR ASSEMBLY



## CARE OF COMMUTATOR AND BRUSHES



TESTING FIELDS FOR GROUNDS OR SHORT CIRCUITS - Disconnect battery and AC line wires from the plant. RAISE ALL BRUSHES FROM COMMUTATOR AND COLLECTOR RINGS. Disconnect DC field wire. Connect one end of test lamp wire to DC field wire. Place other end of test lamp wire to ground on a clean surface of the generator frame. If test lamp burns, the field circuit is grounded. If test lamp fails to burn, the field circuit is not grounded. NOTE: A ground in the field circuit would be indicated by excessive flickering of the lights on the AC line, a dim light, or the generator failing to produce current. Shorted field coils will run much cooler than the rest, and may be located by feeling the temperature of the coils.

REMOVING GENERATOR FROM ENGINE - The generators of these plants are carried directly on a turned diameter of the rear crankcase adapter. If for any reason, mechanical or electrical, it becomes necessary to remove the generator from the engine, proceed in the following manner:

First, disconnect battery cables, main lines and ignition wires from the control unit. Second, remove the cover from the rear of the generator and lift all of the brushes in their guides. When pulled partly out, the brush spring will slip down the side of the brushes and hold them in place to prevent their being damaged when the generator frame is removed. If the plant is one equipped with a gasoline tank atop the generator, disconnect the fuel line from the fuel tank of the carburetor. Remove the four nuts at the rear of the generator bearing support casting, holding the generator frame to the engine crankcase, loosening and removing those at the bottom first. The generator frame can now be pried and pulled from the adapter casting. As the generator frame slips from the guide ring on the adapter casting, support its weight carefully, while it is pulled all the way off the armature. Allowing its weight to hang on the armature, may distort or bend the generator shaft.

After the generator frame has been removed from the crankcase, the armature will be extended from the crankshaft, and care should be taken that the engine is not turned over rapidly, or that nothing is allowed to drop on the armature. The armature can be moved from the crankshaft by loosening the hexagon nut at the rear of the armature shaft so it extends just beyond the end of the armature. Pull on the armature away from the engine and strike the nut a sharp blow with a heavy hammer, to loosen it from the taper holding it in the engine crankshaft. The armature can then be pulled away from the engine, and should be handled carefully, and laid so it will not roll and damage the laminations, commutator or collector rings.

ASSEMBLING GENERATOR TO ENGINE - Before the armature is reinstalled on the crankshaft, grease the taper that carries the forward end of the armature in the crankshaft so it will not rust in operation. Before installing the frame on the crankcase, remove the bearing cap from the rear of the generator, clean the bearing surface in the frame and the bearing on the armature carefully. Line up the notch in the bearing with the pin in the end frame. The frame should be installed over the armature very carefully, and the four cap screws that retain it should be tightened gradually and alternately, never pulling one down tight before the others are nearly down. Repack the bearing with only regular ball bearing grease. See Service instructions.

BRUSH RIG POSITION - It will not be necessary to loosen the bolts retaining the brush rig assembly to the rear of the generator frame during the disassembling of the generator. However, if this has been done accidentally, or for removal of the brush rig for servicing, when the brush rig is reinstalled, it should be turned to the position marked by the small indicating point on the frame of the generator, and the notch or mark on the brush rig. This is called the neutral position, and unless the brush rig is replaced properly in this position, excessive arcing of the brushes, heating of the generator fields and armature, and low voltage production will result.

## RADIO INTERFERENCE

Your Electric Plant has been equipped with shielding and condensers at the factory, which under all ordinary conditions, will allow the operation of ordinary broadcast band Radios without excessive noise or interference from the plant. In some cases where older types of receivers, or receivers operating at lower wave lengths, that is higher frequencies, are used, it is quite impossible to shield the plant, to guard against this interference entirely. Many details can be looked into to help eliminate this interference, and if ordinary care is used in the installation, and in the analysis of these troubles, in about 99% of the cases, simple remedies will do away with this trouble.

In checking the source of radio noise, make all tests with only lights and radio turned on. Some appliances, such as a vacuum cleaner, fan, etc., often cause noises, and not the plant itself. If noise is present only when a certain appliance is turned on, don't blame the plant, but write us, advising which appliance causes noise.

The amount of noise or interference is impossible to predict, for it depends on a large number of factors, the most important of which is the radio itself - on the same plant, one radio will operate perfectly, and another will be very noisy.

If interference or noise is present at certain positions of the dial, first test your radio at a location where it can be connected to city or high line service, then observe the performance at the same dial positions. If the conditions of interference remain the same, it is very likely that the noise is coming from your radio. In other words, do not expect your radio to perform better when connected to the plant than it would were it connected to high line service.

If radio interference is found to come from the plant, the following suggestions may aid you in reducing the noise.

It must be remembered that every installation presents a different problem. There are no two installations alike, which makes it almost impossible to give simple instructions for eliminating such radio noises as may arise. It is purely a case of experimenting with each case of noise until it is eliminated.

Be sure the plant is properly grounded. The white main line wire leading from the generator is connected to the frame of the plant. This wire should be at some point very close to the plant, connected to a substantial post or pipe which connects directly to the ground. The distance between the plant and ground pipe should be as short as possible. In order to secure good results it is necessary to drive the pipe at least four feet into the ground directly beside the plant and make substantial connections to the pipe from the white ground wire. Wherever it is possible or convenient to run a wire from the main line which is connected to this white generator wire, this should be done. In other words, at several additional points in the circuit, the grounded main line wire should be again grounded to a substantial ground post.

All radios are equipped with a lead which should be connected to a ground post. In all cases, use a ground separate from the main line circuit ground, when this wire is connected.

## RADIO INTERFERENCE (CONT'D)

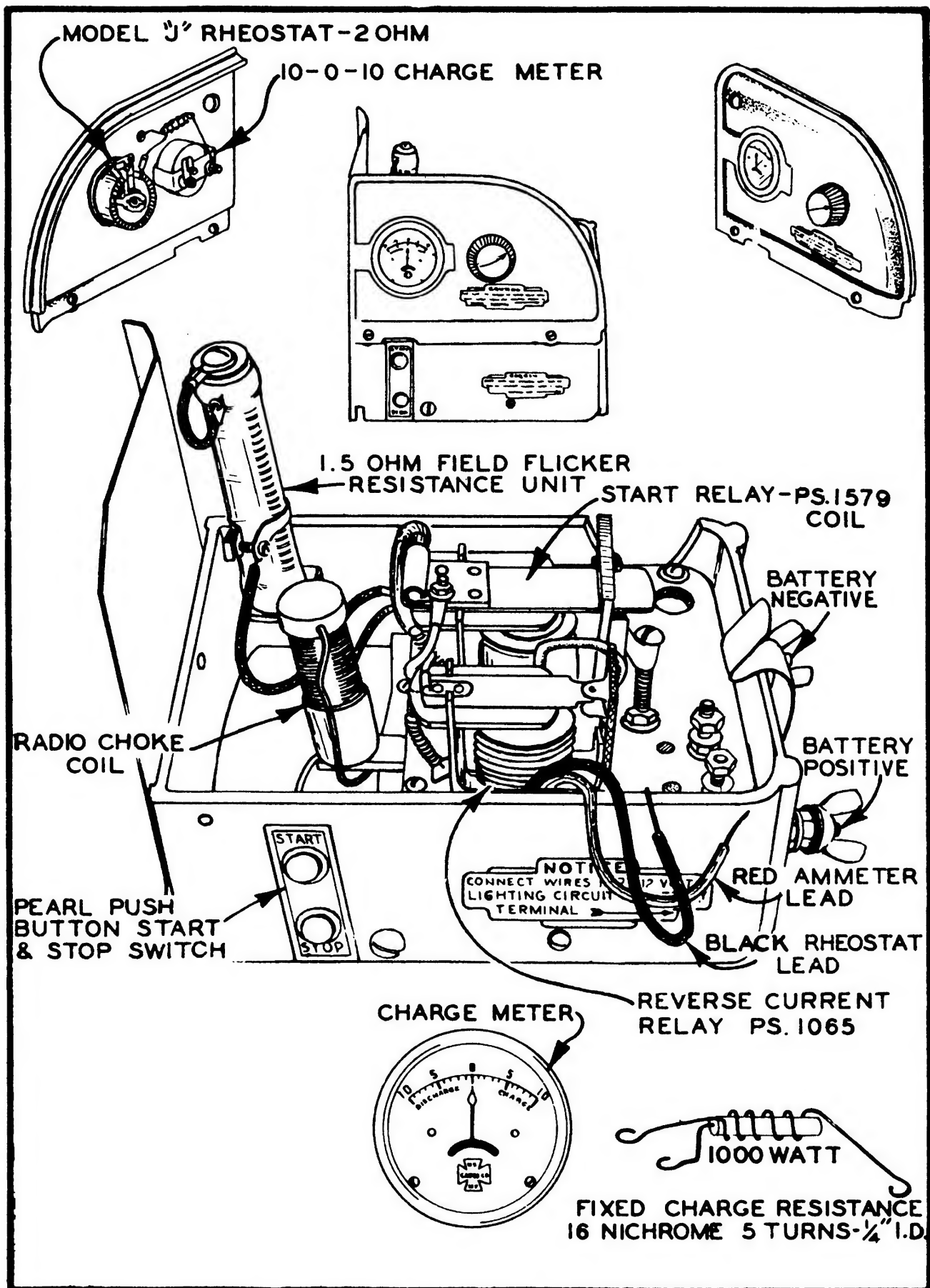
Sometimes reversing the plug on the radio, where it is plugged into the line socket, helps a great deal. The radio itself should be located not less than fifty feet from the plant. The farther apart plant and radio are, the less interference there is apt to be. The radio aerial should be located as far as possible from the line wires, and should run at right angles, not parallel to, the line wires. The radio aerial lead-in wire should preferably be of the shielded type. However, before spending money for this purpose, disconnect aerial entirely from radio and remove it at least five feet away from radio. If noise is reduced with aerial disconnected, then a shielded lead-in wire will probably help.

The spark plug on your plant is covered with a suitable metal shield which is screwed securely to the spark plug base and grips the armor-covered ignition high tension cable securely. This spark plug cover is the most effective means for eliminating spark interference, and should always be in place when the plant is used to supply power for radios.

Radio interference can also be carried to the radio over the AC main line wires or over the start-stop station wires. To check for noise coming from this source, proceed as follows:

With the plant running and radio connected, note the amount of noise. Then disconnect the three wires running to the start-stop switch at the plant, removing the ends several feet away from the plant. If the noise continues, it is not carried over the start-stop wire. If the noise is reduced, it is carried by these wires, and can be easily corrected. Secure a  $1/4$  or  $1/2$  MFD condenser (which can be obtained at any radio repair shop - or use an automobile ignition condenser) and connect one lead to #1 terminal of control panel, other lead to #2 terminal. Use short leads not over 4 inches long and fasten condenser securely so that it cannot move about and cause possible short circuits. If the noise is decreased, another condenser of same size connected between #1 and #2 terminals of the start-stop station itself, nearest the radio, will probably reduce it still farther.

To check for noise coming over the AC main line wires, first check the amount of interference with the aerial connected to the radio. Then note the amount of noise with the aerial disconnected from the radio. If the same amount of noise is present with the aerial disconnected, then it is reasonably sure that the interference is being carried over the main line wires. This can be corrected by connecting a 1 MFD condenser across the main line wires at the plant. On plants equipped with a filter condenser, excessive radio interference would indicate an open condenser and should be replaced.



CONTROL ASSY.



## SERVICE DIAGNOSIS

### GENERAL

BEFORE CHECKING FURTHER FOR TROUBLES BE SURE THAT ALL WIRING IS PROPERLY INSTALLED, AND THAT PLANT HAS BEEN SERVICED WITH PROPER GRADE OF FUEL AND OIL.

1. ENGINE FAILS TO START OR IS HARD TO START:
  - (a) Heavy Load on Plant from Motors, Appliances, etc.
  - (b) Too Heavy Oil. Thickened due to drop in Temperature.
  - (c) Fuel Tank Empty - Low Grade of Fuel used.
  - (d) Air Lock in Fuel Line.
  - (e) Improper Fuel Mixture - Air Cleaner Clogged.
  - (f) Defective Ignition.
  - (g) Spark Plug Fouled - Too large or small gap - Porcelain Cracked.
2. ENGINE STARTS, BUT DOES NOT CONTINUE RUNNING:
  - (a) Overheated - Poor Ventilation.
  - (b) Piston Sticking - Excessive Carbon deposit.
  - (c) Air Lock in Fuel System. Air Vent Clogged.
  - (d) Dirt, Water or Ice in Fuel System.
  - (e) Heavy Load on Plant from Motors, Appliances, etc.
  - (f) Defective or Shorted Stop Button.
  - (g) Short Circuit on Line. Defective Motors or Appliances.
  - (h) Faulty Ignition - Breaker Arm Sticking.
3. PLANT STARTS, BUT DOES NOT PRODUCE CURRENT:
  - (a) Open Line Wire or Switch.
  - (b) Defective Panel Wiring, or hook up.
  - (c) Blown Fuses.
  - (d) Brushes Stuck in Holders and not touching Commutator.
  - (e) Brushes worn too low and not seating properly. (See Generator Section).
4. PLANT RUNS TOO HOT:
  - (a) Spark Advanced or Retarded.
  - (b) Exhaust Back-up - Improper discharge.
  - (c) Improper Ventilation (See Installation section).
  - (d) Air Cleaner "Too Dirty".
  - (e) Low Oil Level or Improper Grade for Climatic Conditions.
  - (f) Carburetor Mixture too Rich
5. PLANT USES EXCESSIVE AMOUNT OF OIL:
  - (a) Oil not changed often enough - Dirty Oil (See Lubrication Section).
  - (b) Too Rich a mixture, causing excessive Cylinder Wear - Check Oil Level.
  - (c) Piston Rings Stuck, due to improper Lubrication, overheating or defective plugs.
  - (d) Engine Overheated, due to poor ventilation.

### ENGINE SERVICE DIAGNOSIS

#### LACK OF POWER

- |  |                                    |
|--|------------------------------------|
| 1. Low or Poor Compression             | 4. Air Cleaner Restricted          |
| 2. Ignition System Defective           | 5. Low Octane Fuel                 |
| 3. Carburetor not Functioning Properly | 6. Overheating                     |
|  | 7. Improper Grade Viscosity of Oil |

#### OVERHEATING

- |   |   |
|---|---|
| 1. Insufficient amount of Air Circulation | 5. Ignition System Defective - See "Magnet" Section |
| 2. Improper Grade & Viscosity of Oil.     |   |
| 3. Fuel Mixture too Lean or Rich          | 6. Valve Timing Too Early                           |
| 4. Air Cleaner Restricted                 |   |

## SERVICE DIAGNOSIS

### ENGINE

#### POOR COMPRESSION

- |                                   |  |
|-----------------------------------|--|
| 1 Incorrect Valve Clearance       | 6 Cylinder Head Gasket Leaking         |
| 2 Valve Stems or Lifters Sticking | 7 Piston Rings Broken, Worn or Stuck   |
| 3 Valve Stems or Guides Worn      | 8 Pistons or Rings Improperly Fitted   |
| 4 Valve Springs Weak or Broken    | 9 Piston Ring Grooves Worn             |
| 5 Valve Timing Incorrect          | 10 Cylinder Scored or Worn Excessively |

#### EXCESSIVE CYLINDER AND PISTON WEAR

- |   |  |
|---|--|
| 1 Improper Grade & Viscosity of Oil         | 6 Piston Rings not Properly Fitted to<br>Piston Groove and Cylinder Wall |
| 2 Lack of Oil                               | 7 Piston Rings Stuck in Piston Grooves<br>or Broken                      |
| 3 Dirty Oil                                 | 8 Air Cleaner Not Clean, Allowing Dirt<br>to Enter Combustion Chamber    |
| 4 Overheating                               | 9 Carburetor Fuel Mixture too Rich                                       |
| 5 Piston Improperly Installed and<br>Fitted |  |

#### CRANKSHAFT BEARING FAILURE

- |  |  |
|--|--|
| 1 Crankshaft Bearing Journal Out of<br>Round | 6 Bearings Improperly Fitted                 |
| 2 Crankshaft Bearing Journal Rough           | 7 Bearings Loose in Crankcase                |
| 3 Crankshaft Oil Passage Restricted          | 8 Crankshaft or Bearings Out of<br>Alignment |
| 4 Bearings Sprung                            | 9 Lack of Oil                                |
| 5 Bearings Loose                             | 10 Low Oil Pressure                          |
|  | 11 Improper Grade & Viscosity of Oil         |

#### CONNECTING ROD BEARING FAILURE

- |                            |                                      |
|----------------------------|--------------------------------------|
| 1 Crankshaft Surface Rough | 6 Loose in Connecting Rod            |
| 2 Restricted Oil Passage   | 7 Bent Connecting Rod                |
| 3 Bearings Sprung          | 8 Lack of Oil                        |
| 4 Bearings Loose           | 9 Low Oil Pressure                   |
| 5 Improperly Fitted        | 10 Improper Grade & Viscosity of Oil |

#### BURNED VALVES AND SEATS

- |   |  |
|---|--|
| 1 Improper valve clearance                                | 7 Improper Type Valves - Use,<br>Genuine Parts |
| 2 Weak Valve Springs                                      | 8 Valve Head Too Thin Causing Hot<br>Sections  |
| 3 Improper Valve Timing                                   | 9 Fuel Mixture Flow Restricted                 |
| 4 Late Ignition Timing                                    | 10 Valve Seats too Narrow                      |
| 5 Excessive Carbon Deposits Around<br>Seat and Valve Head | 11 Overheating                                 |
| 6 Valves Sticking in Guides                               |  |

#### VALVE STICKING

- |  |                                     |
|--|-------------------------------------|
| 1 Incorrect Valve Clearance                              | 4 Valve Stems Scored or Dirty       |
| 2 Insufficient Clearance Between<br>Valve Stem and Guide | 5 Valve Lifters Sticking            |
| 3 Valve Springs Weak or Broken                           | 6 Use of Fuel with High Gum Content |

#### EXCESSIVE OIL CONSUMPTION

- |  |   |
|--|---|
| 1 Piston Rings Broken, Worn or Stuck                 | 6 Crankshaft & Connecting Rod Bear-<br>ing Worn or Excessive End Play |
| 2 Piston Rings Improperly Fitted                     | 7 Overheating   |
| 3 Piston Ring Slots Clogged with Carbon              | 8 Improper Grade & Viscosity of Oil                                   |
| 4 Cylinder Bore Out of Round or Ex-<br>cessive Taper | 9 Excessive Oil Pressure  |
| 5 Cylinder Bore Scored or Badly Worn                 | 10 Oil Level too High   |
|  | 11 Oil Leaks at Gaskets and Seals                                     |

## SERVICE DIAGNOSIS

### ENGINE

#### IGNITION SYSTEM

- |                         |                                       |
|-------------------------|---------------------------------------|
| 1 Loose connections     | 4 Stop wire grounded                  |
| 2 Pitted breaker points | 5 Ignition coil defective             |
| 3 Defective condenser   | 6 Incorrect setting of breaker points |

#### LOW OIL PRESSURE

- |                                     |   |
|-------------------------------------|---|
| 1 Improper Grade & Viscosity of Oil | 4 Excessive Crankshaft & Connecting Rod Bearing Clearance |
| 2 Oil Pressure Relief Valve Stuck   | 5 Oil Pump Worn Excessively                               |
| 3 Oil Pump Screen Clogged           |   |

#### POPPING, SPITTING & SPARK KNOCK

Pinging or Spark Knock - Caused by Ignition Being Advanced too Far.  
Popping or Spitting - Advance or Late Ignition.

- |   |   |
|---|---|
| 1 Defective Ignition System.  | 7 Excessive Carbon Deposits in Combustion Chamber |
| 2 Carburetor Not Properly Adjusted.                                   | 8 Valves Not Seating Properly                     |
| 3 Valve Clearance Adjusted too Close.                                 | 9 Valve Timing Early                              |
| 4 Weak Valve Springs  | 10 Piston & Rings in Poor Condition               |
| 5 Hot Spot in Cylinder Head, Usually Caused by Clogged Water Passages | 11 Inferior Grade of Fuel                         |
| 6 Exhaust Valve Head too Thin Causing Hot Sections                    |   |

## GENERATOR SERVICE DIAGNOSIS

### GENERATOR HEATING

May be due to one of the following causes:

1. Overload on the line
2. A short circuit of a coil or number of coils in the winding.
3. Grounds in the armature windings or Commutator
4. Poor Commutation
5. Overheating of the entire unit, may be caused by:

- (a) Unequal air gap
- (b) A shorted out or grounded field winding
- (c) A reversed field coil winding

NOTE: Any of these troubles cause a large circulating current in the exciter armature windings to the commutator, to the brushes and brush connections, which will cause artificial overloading of the armature. The air gap should not vary over a few percent either way from the average value. All field coils of the shunt type should have within 10% of the same resistance, and a higher value than this indicates shorted turns in the winding.

### FIELD COIL HEATING

1. Too high an operating speed of the plant, with a resultant high output voltage.
2. A partial short-circuit of one coil.

## SERVICE DIAGNOSIS

### POOR COMMUTATION

#### GENERATOR

1. The brushes not set correctly in respect to the neutral position.
2. Brushes may not be fitted to the surface of the commutator.
3. Brushes binding in the holders.
4. Brushes may not be equally spaced around the commutator.
5. The brushes may have reached their limit of wear, with the result that there will be an insufficient amount of brush spring tension.
6. Brush pressure insufficient.
7. Some brushes may have excessive pressure, and be taking more than their share of the current.
8. The carbon brushes may be of an unsuitable grade. Metal graphite brushes are generally not used on voltages higher than 30 to 40 volts. Great care must be taken to be sure that the proper grade is operating on the machine when replacements are made.
9. Commutator bars may be loose or projecting above the others.
10. High Mica. This prevents a proper contacting surface between the brush and the commutator.
11. A variation in the air gap of the machine or strength of the field poles, will also cause severe sparking at the commutator.

### FAILURE OF GENERATOR BUILD-UP

1. The speed of the set may be below normal.
2. A reversed field winding.
3. A reversed shunt field.
4. The brushes incorrectly located, and not on neutral position.
5. An external short circuit on the line would prevent its building up.
6. An open circuit in the shunt field.

### NOISE IN BRUSHES

1. Noise in brushes is due to a rough commutator, caused by high and low bars. This difficulty may only be corrected by turning the commutator in a lathe.

COMMUTATOR - Mica is used for insulation between the commutator bars. After the armature is turned, the mica is cut away about  $1/32$ " below the surface of the bars. The surface of the bars will wear down to the level of the mica eventually. The mica is harder than the copper, and it forms ridges which cause the brushes to jump and make poor contact. High mica should be undercut carefully, and the commutator re-turned and cleaned.

The commutator should maintain a polished surface. Blackening of all the bars indicates incorrect brush positions. Blackening of groups of bars at regular intervals indicates a rough, eccentric commutator.

A severely burned bar or number of bars, indicates an open circuit in the armature, which will also be noted by excessive flashing when the machine is operating with load. This type of difficulty can only be corrected by competent armature repair service men.

Ordinarily the commutator will require only an occasional wiping with a non-linting material, but if blackening appears and grows worse, the cause must be determined and removed.

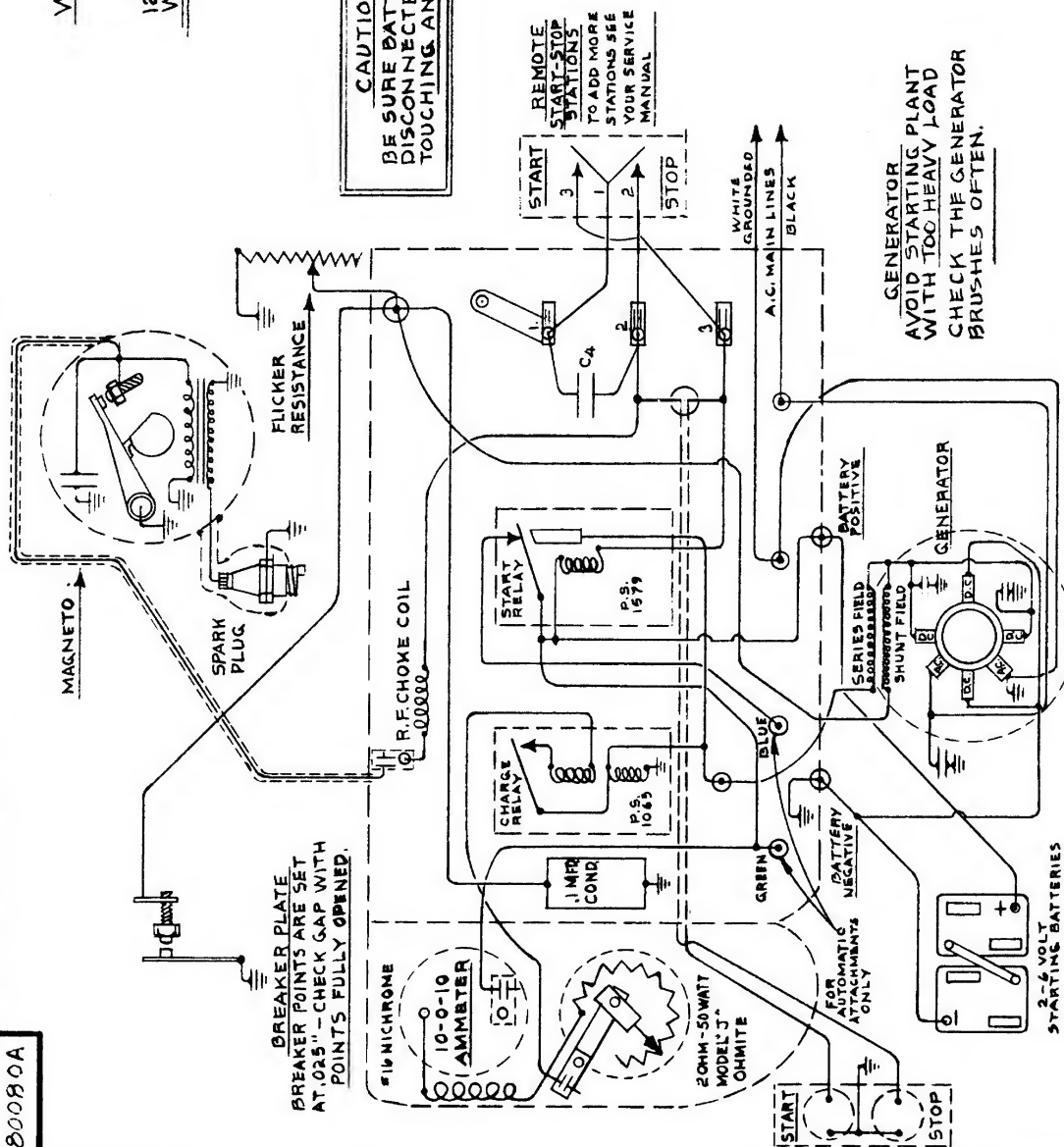
Use no lubricant on the commutator. The use of any lubricant will only cause sparking and increase the commutation difficulties.

BRUSHES - See that the brushes move freely in the holders and at the same time make firm even contact with the commutator. The brushes should all have the same spring tension to prevent one from carrying more than its share of the load. An extra set of brushes should always be kept on hand.

See that both the interior and the exterior of the machine are kept free from metal dust, dirt of any description or water.

80080A

WIRING DIAGRAM  
FOR  
SINGLE CYLINDER  
ELECTRIC START  
12 VOLT CRANKING  
WITH MAGNETO IGNITION



BREAKER PLATE  
BREAKER POINTS ARE SET  
AT .025" - CHECK GAP WITH  
POINTS FULLY OPENED.

CAUTION  
BE SURE BATTERY IS  
DISCONNECTED BEFORE  
TOUCHING ANY RELAYS

STARTING THE PLANT WITH  
A DISCHARGED BATTERY

IF AT ANY TIME THE BATTERY BECOMES  
DISCHARGED TO A POINT WHERE THE PLANT  
CANNOT BE STARTED BY MEANS OF THE PUSH  
BUTTON, IT MAY BE CRANKED MANUALLY  
WITH THE ROPE STARTER. THIS PLANT IS  
EQUIPPED WITH MAGNETO IGNITION WHICH  
IS UNAFFECTED BY THE CONDITION OF THE  
BATTERY

FLICKERING LIGHTS

TO ELIMINATE FLICKERING LIGHTS CLEAN THE  
RESISTANCE BREAKER POINTS CAREFULLY AND  
ADJUST TO EXACTLY .025" TWENTY FIVE THOU-  
SANDTHS WHEN FULLY OPENED BY THE BREAKER.  
DO NOT ADJUST THE FIELD RESISTANCE SLIDER  
POSITION.

BATTERY CHARGING

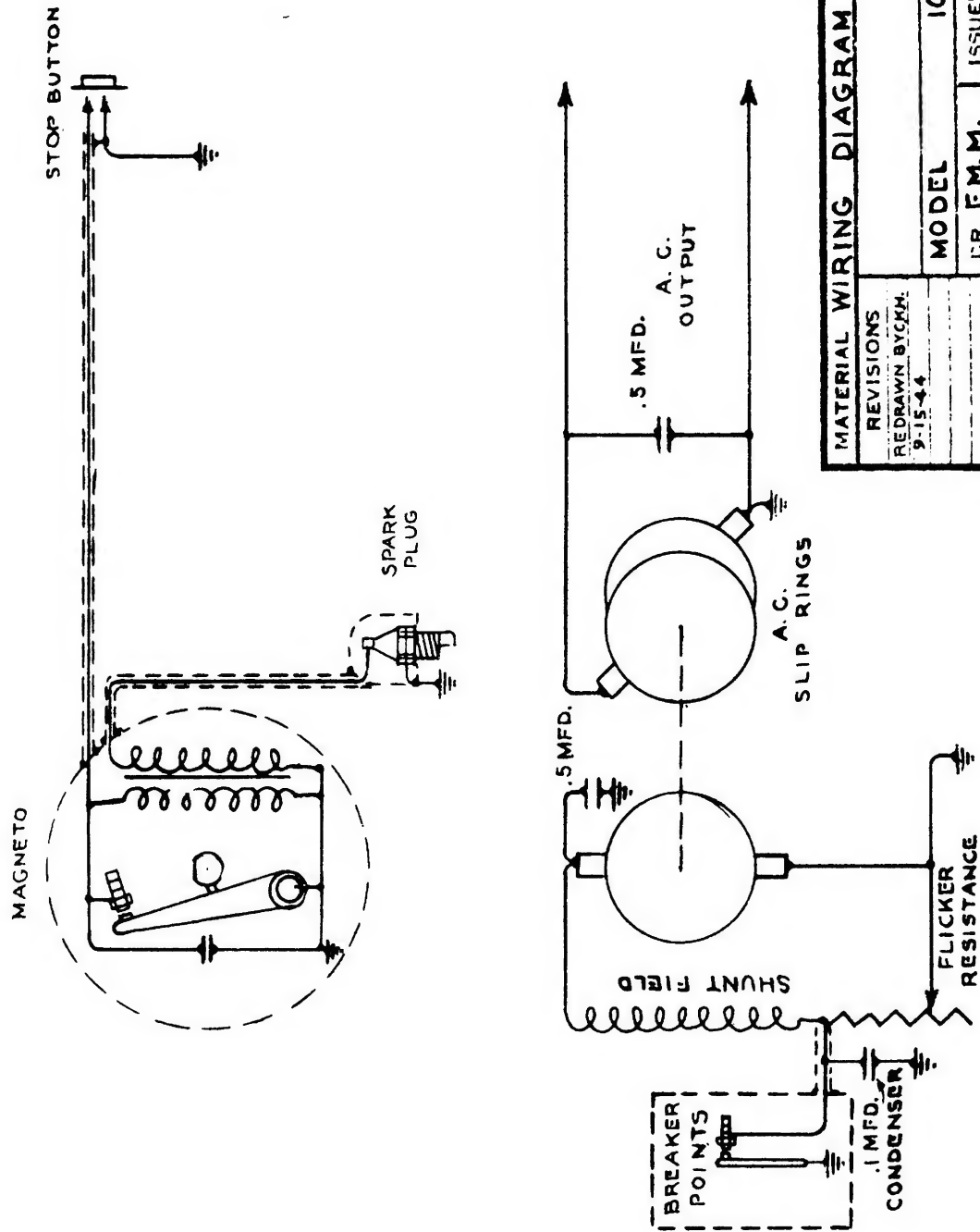
A VARIABLE CHARGING CONTROL IS PROVIDED SO THAT 12 VOLT  
LAMPS MAY BE OPERATED TO SUPPLY LIGHT FOR ONE OR TWO ROOMS  
WITHOUT RUNNING THE PLANT. IT WILL BE NECESSARY TO IN-  
CREASE THE RATE TO 5-10 AMPERES IN PROPORTION TO THE AMOUNT  
THE LIGHTS ARE USED TO PREVENT DISCHARGING THE BATTERY.  
IF THE SEPARATE 12 VOLT LIGHTING SYSTEM IS NOT USED, THE  
RATE MUST BE DECREASED TO 2 OR 3 AMPS. TO PREVENT OVER-  
CHARGING - CHECK CONDITION OF THE BATTERY OFTEN WITH HY-  
DROMETER TO PREVENT OVERCHARGING WHICH WILL SHORTEN  
BATTERY LIFE. IF THE BATTERY CHECKS LOW (BELOW 1200  
SPECIFIC GRAVITY) INCREASE THE CHARGING RATE - OR IF IT IS  
HIGH (ABOVE 1250 SPECIFIC GRAVITY) REDUCE THE CHARGING  
RATE SLIGHTLY.

GENERATOR  
AVOID STARTING PLANT  
WITH TOO HEAVY LOAD  
CHECK THE GENERATOR  
BRUSHES OFTEN.

C1, C2, C3, C4 = 1MFD. CONDENSERS

MATERIAL WIRING DIAGRAM			
REVISIONS	DATE	ISSUED	SCALE
1. CHECKED BY J. J. J.	5-17-39	DR. E. M. J.	10 L S
2. REVISED BY J. J. J.	5-17-39	CH.	PART NUMBER
			80080A
			DATE: 7/16/44

80102A



# MATERIAL WIRING DIAGRAM

REVISIONS  
REDRAWN BY CMM.  
9-15-44

MODEL 10L MANUAL

DR. F.M.M. ISSUED SCALE-

CH. PART NUMBER

DATE 7-28-42 80102A



# **INSTRUCTIONS FOR ORDERING REPAIR PARTS**

**FOR SERVICE OR PARTS, SEE THE DEALER FROM WHOM YOU PURCHASED THIS EQUIPMENT, OR REFER TO THE COMPANY REFERRED TO ON THE NAMEPLATE.**

Following these instructions will help to fill your order promptly and correctly.

Be sure to state on your order the Model Number and Serial Number, of the plant for which the parts are required. Obtain these numbers directly from the nameplates on the plant.

Order parts by part numbers and complete descriptions as listed herein. State the quantity of each part desired. Do not order parts as "sets" unless they are listed as "sets" in the parts list. If unable to identify the part required, return the old part to the address shown on the nameplate. Be sure to print your name and address plainly on the package. Regardless of any previous correspondence, write a letter to the same address describing the part and stating the reason for returning it.

Please do not order parts in a letter in which some other subject is treated. State definite shipping instructions when ordering parts.

All shipments are complete unless the packing list indicates items are back ordered. Shipments are properly packed and in good order when delivered to the transportation company. Any claim for loss or damage in transit should be filed promptly against the transportation company making the delivery.

Prices quoted herein are F.O.B. factory.

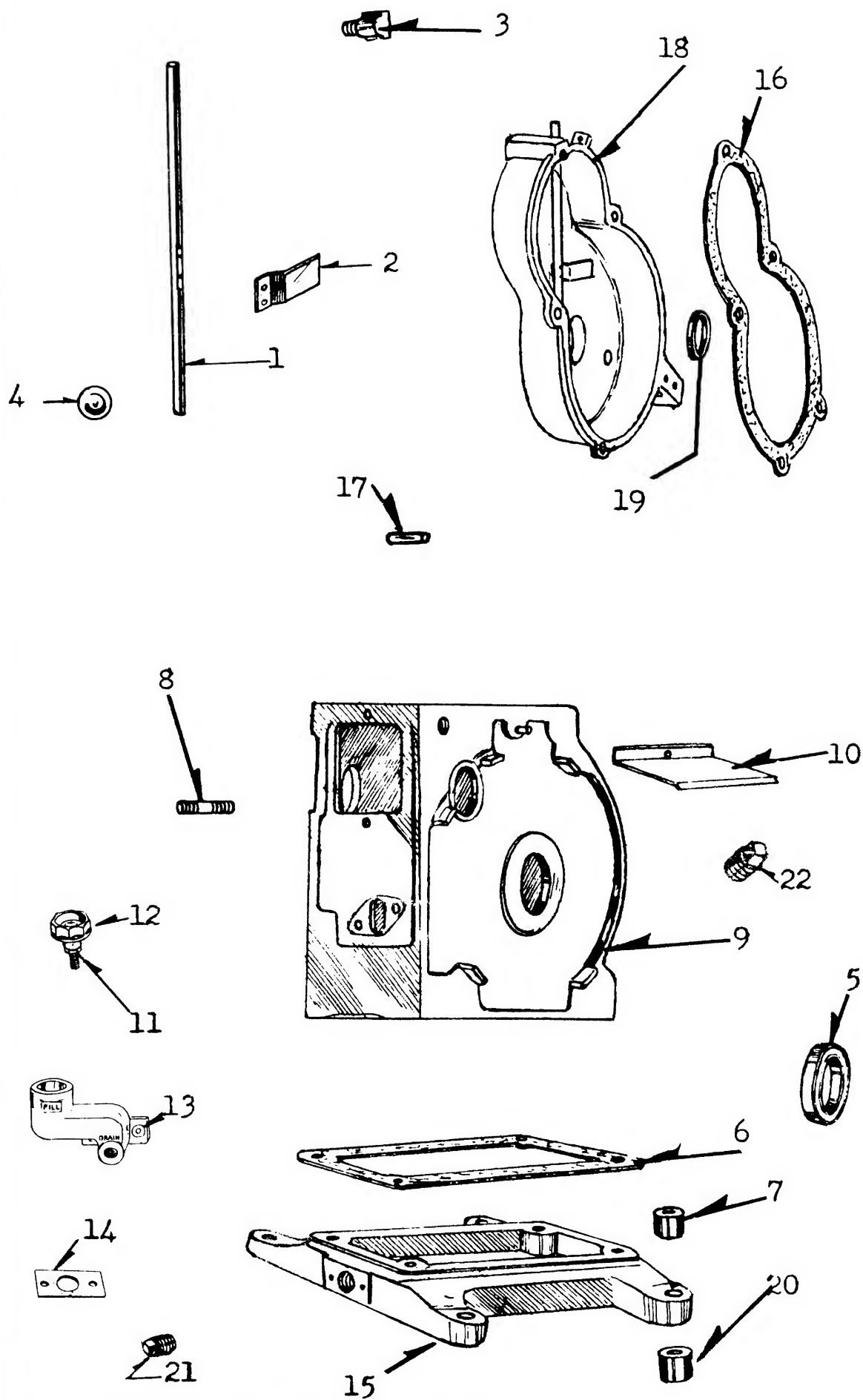


FIG. 1 CRANKCASE, OIL BASE  
AND GEAR COVER GROUP

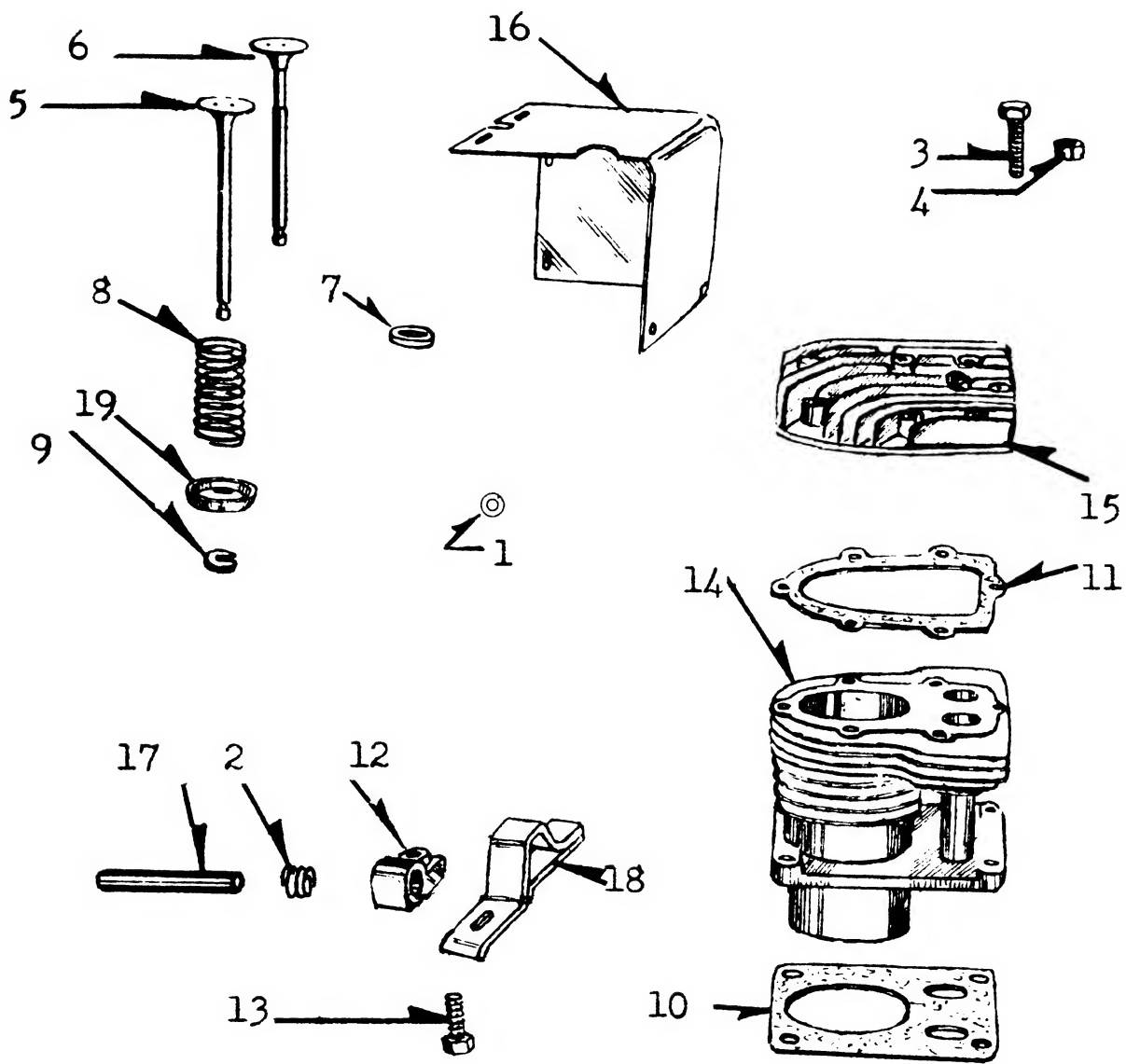


FIG. 2 CYLINDER AND VALVE GROUP

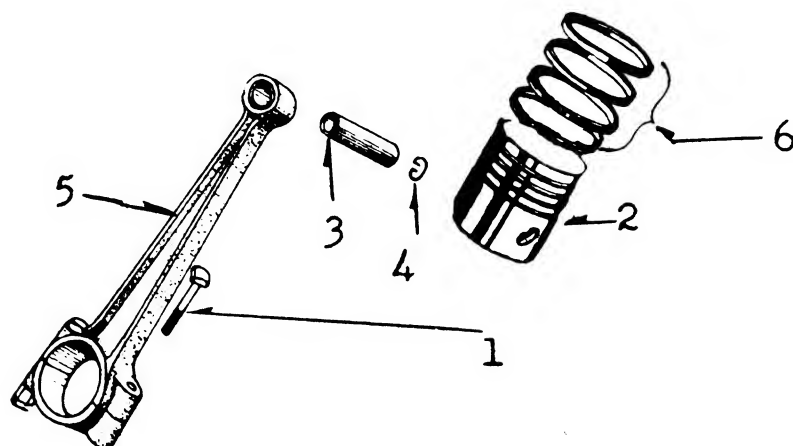


FIG. 3 PISTON AND CONNECTING ROD GROUP

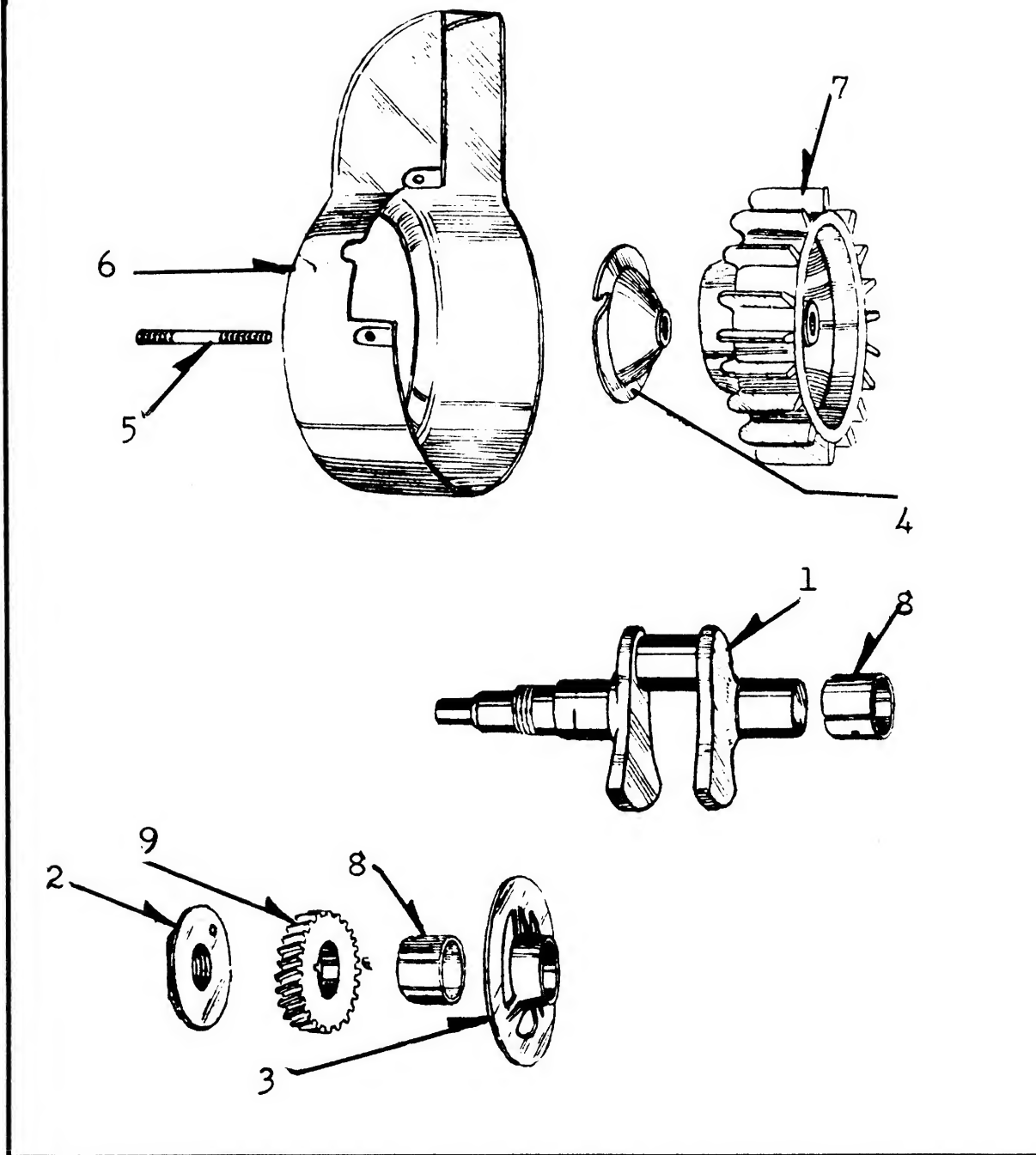


FIG. 4 CRANKSHAFT AND FLYWHEEL GROUP

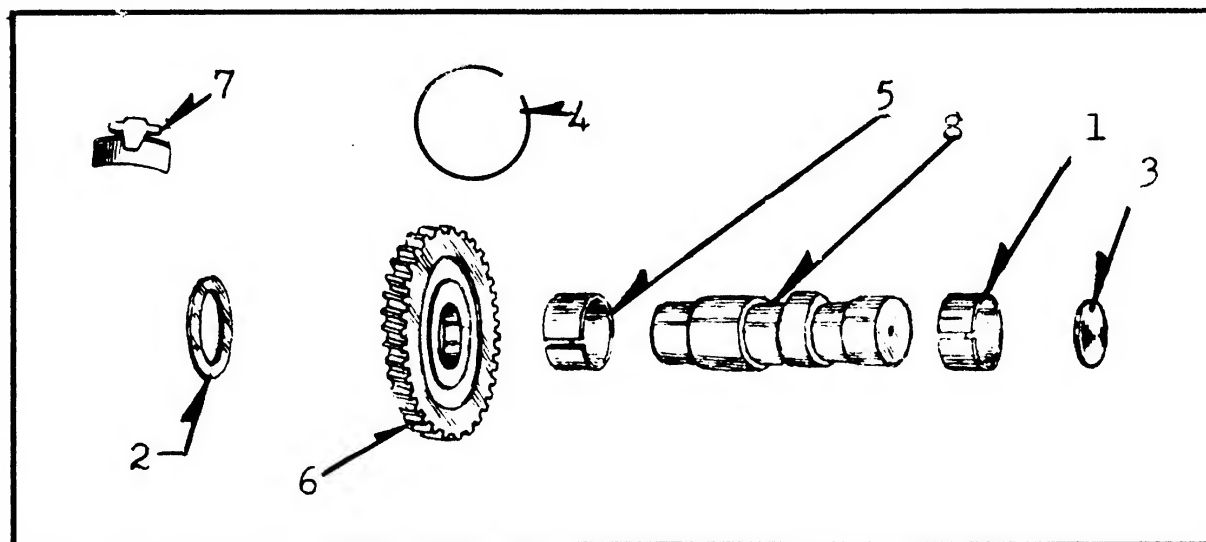


FIG. 5 CAMSHAFT GROUP

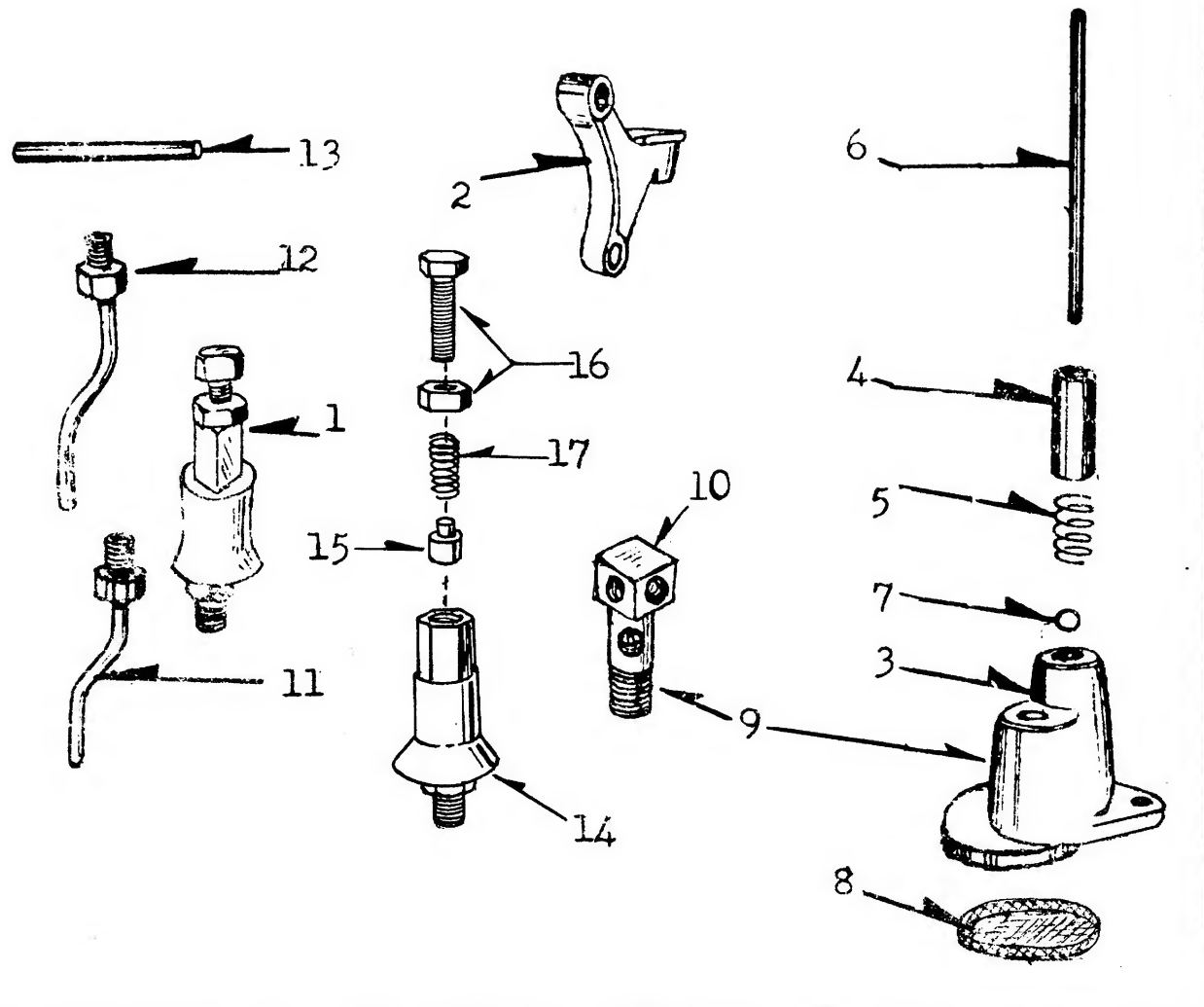


FIG. 6 OIL PUMP AND ACCESSORIES GROUP

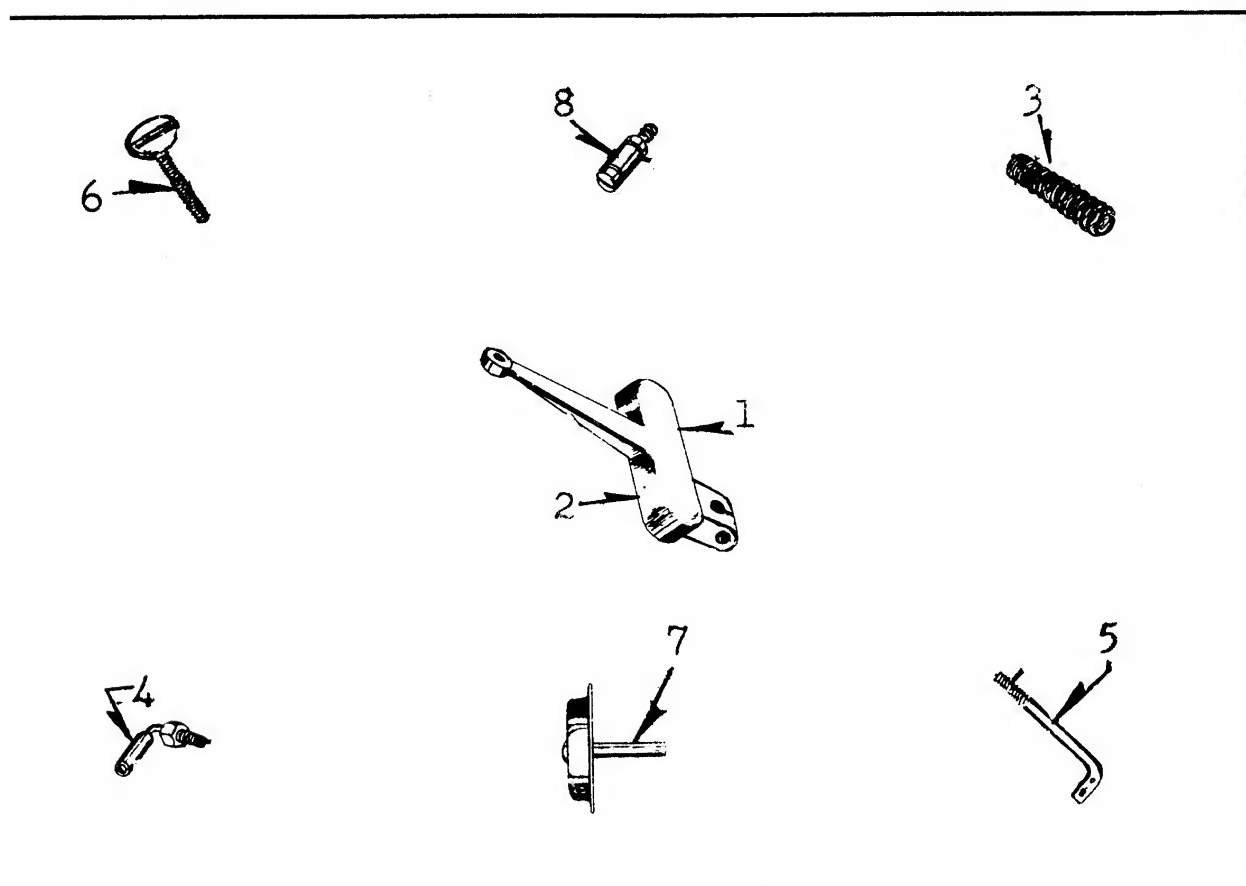


FIG. 7 GOVERNOR GROUP

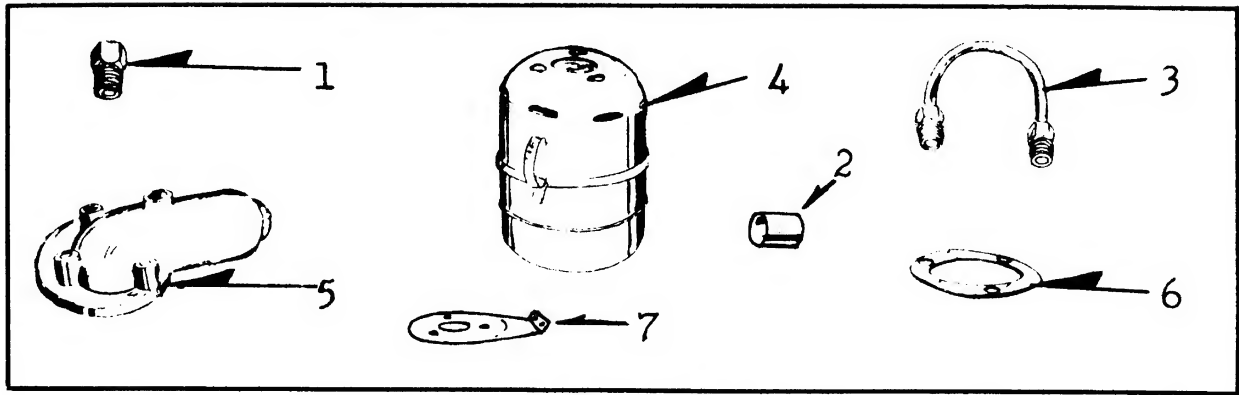


FIG. 8 AIR CLEANER GROUP

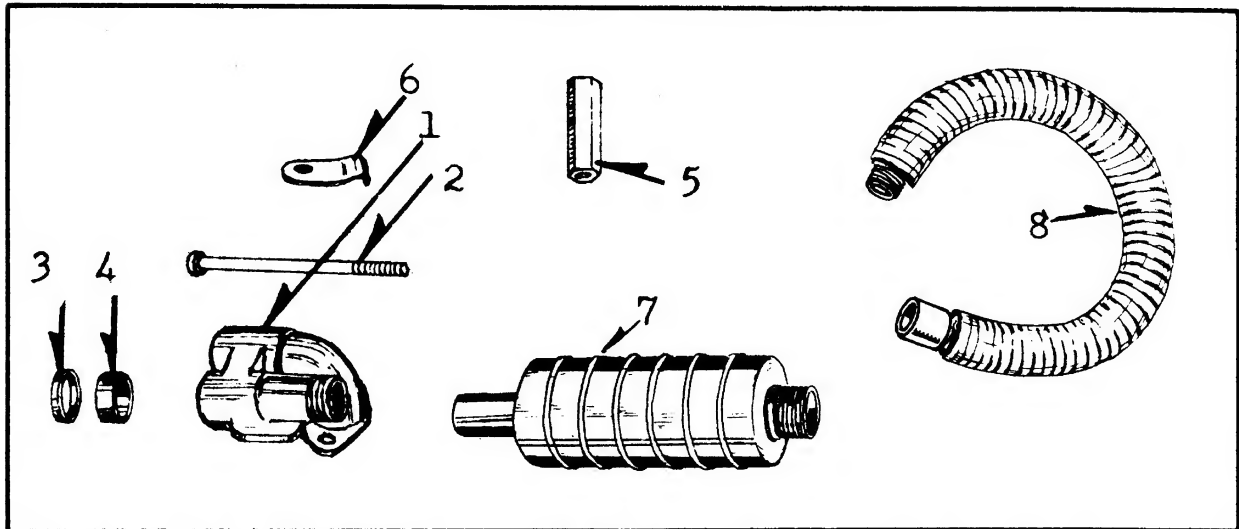


FIG.9 MUFFLER AND MANIFOLD GROUP

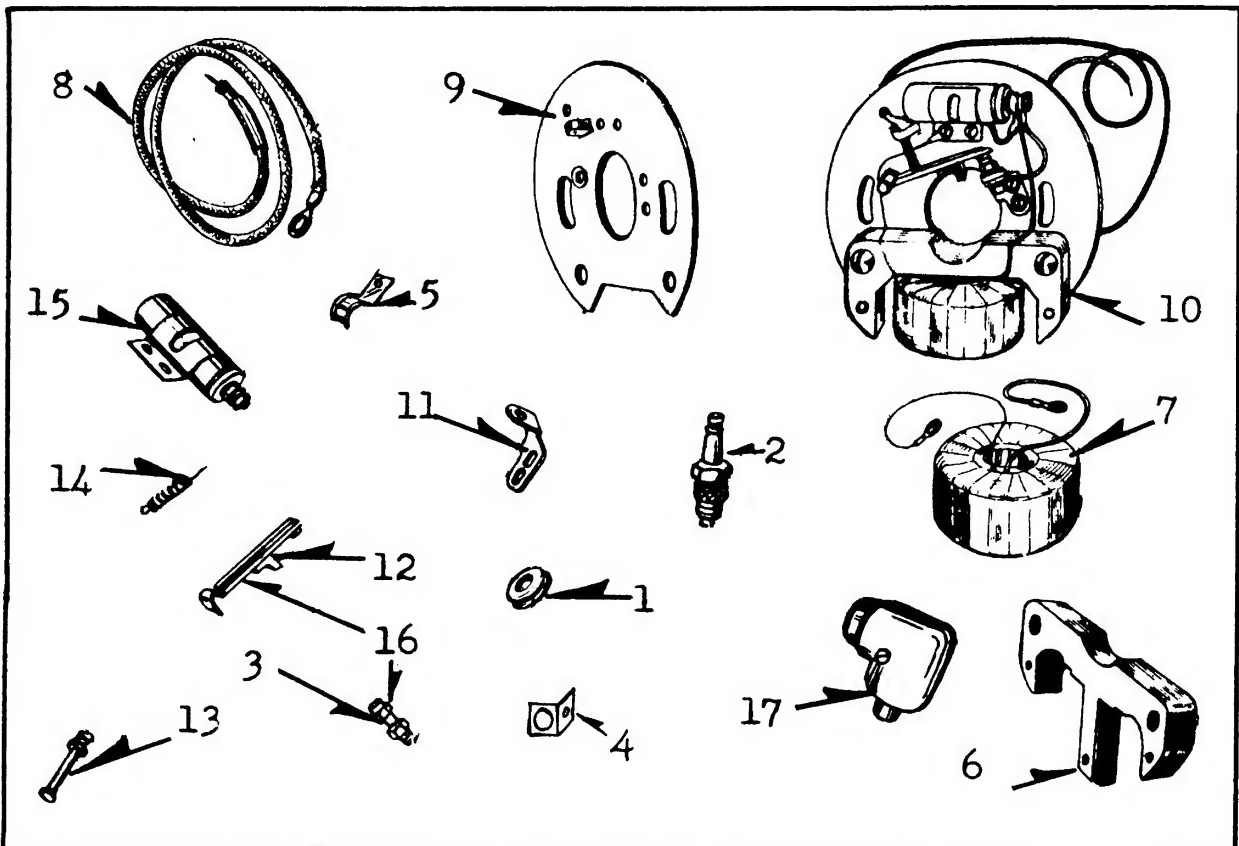


FIG. 10 IGNITION GROUP



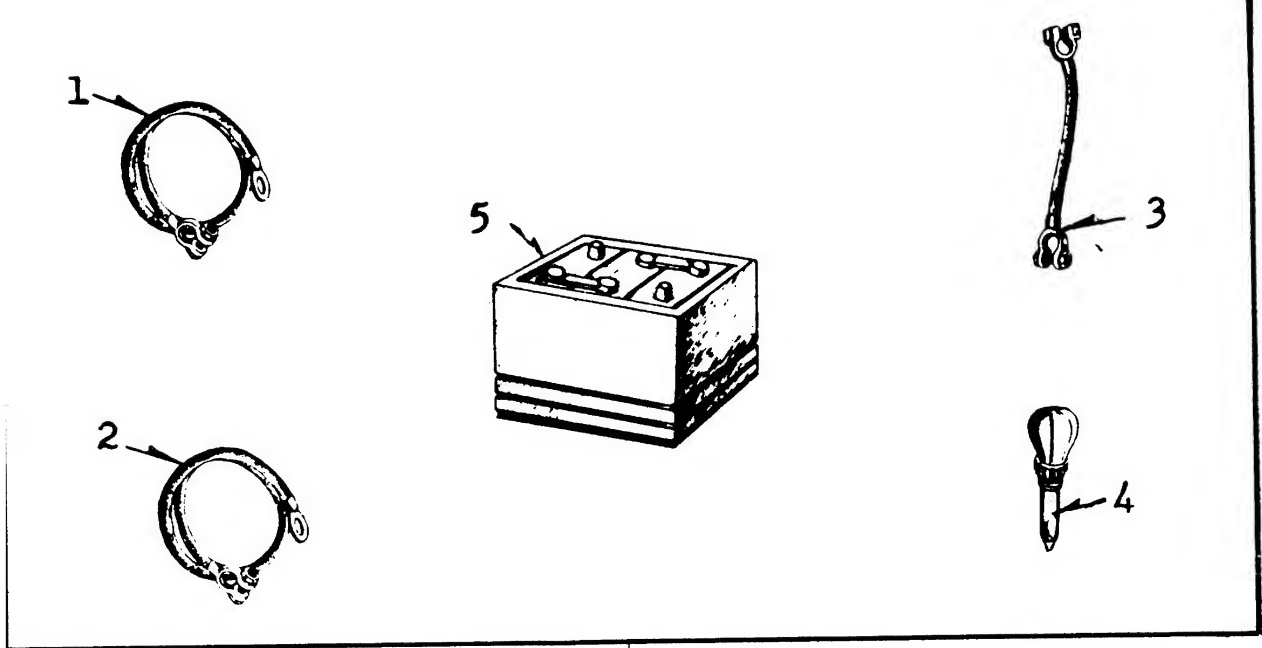


FIG. 11 BATTERY GROUP

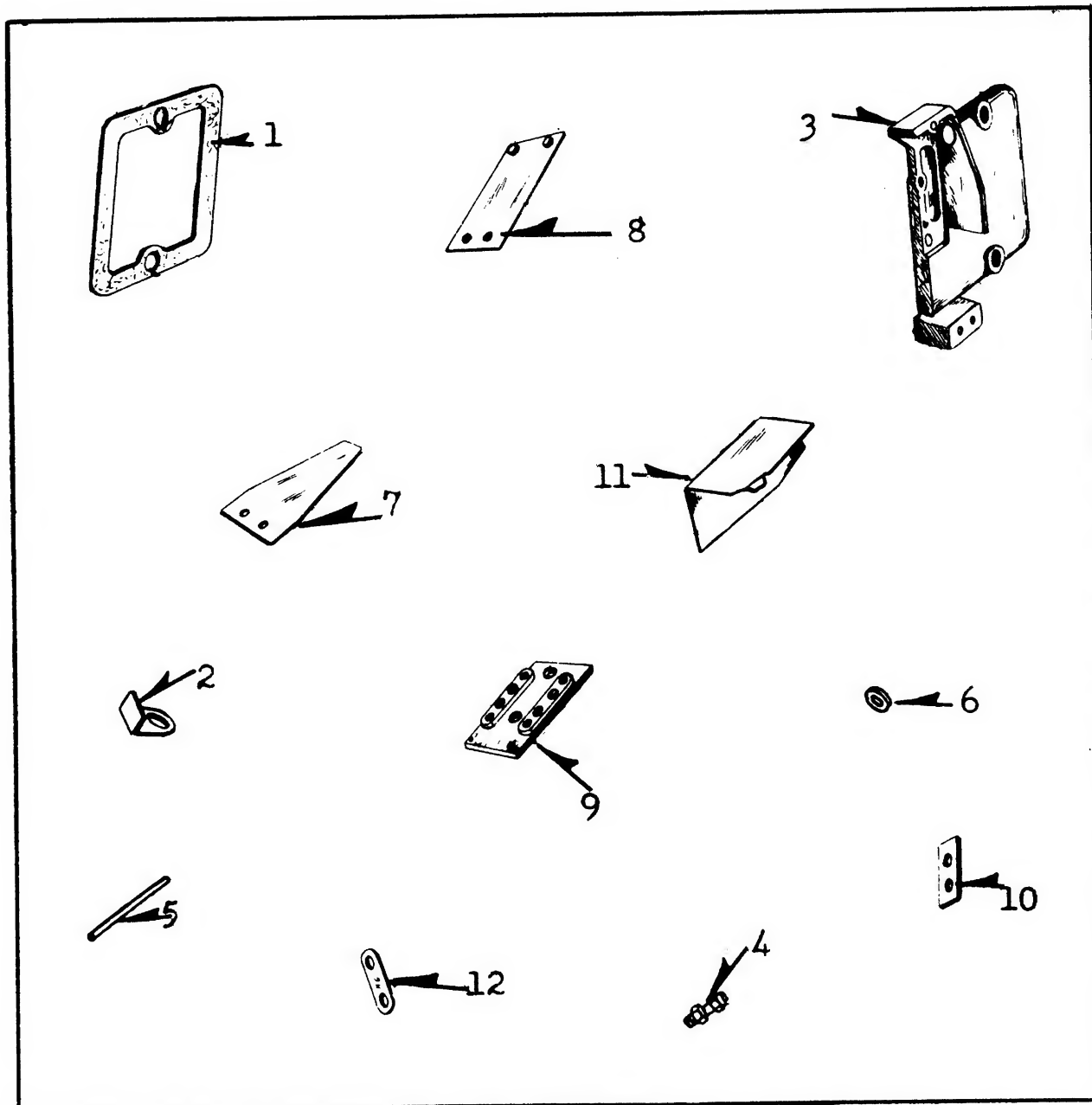


FIG. 12 ANTI-FLICKER BREAKER GROUP

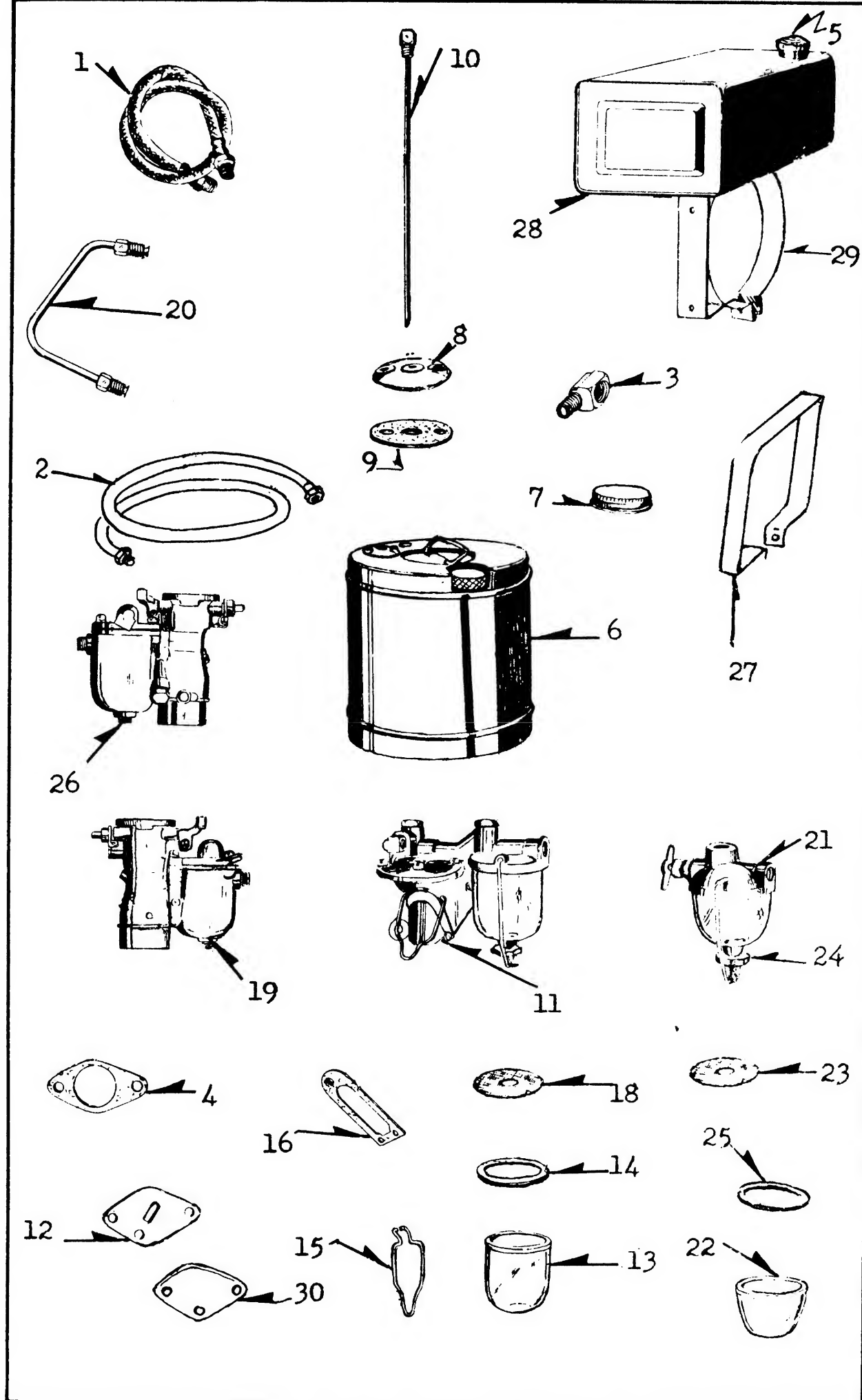


FIG. 13 FUEL SYSTEM GROUP

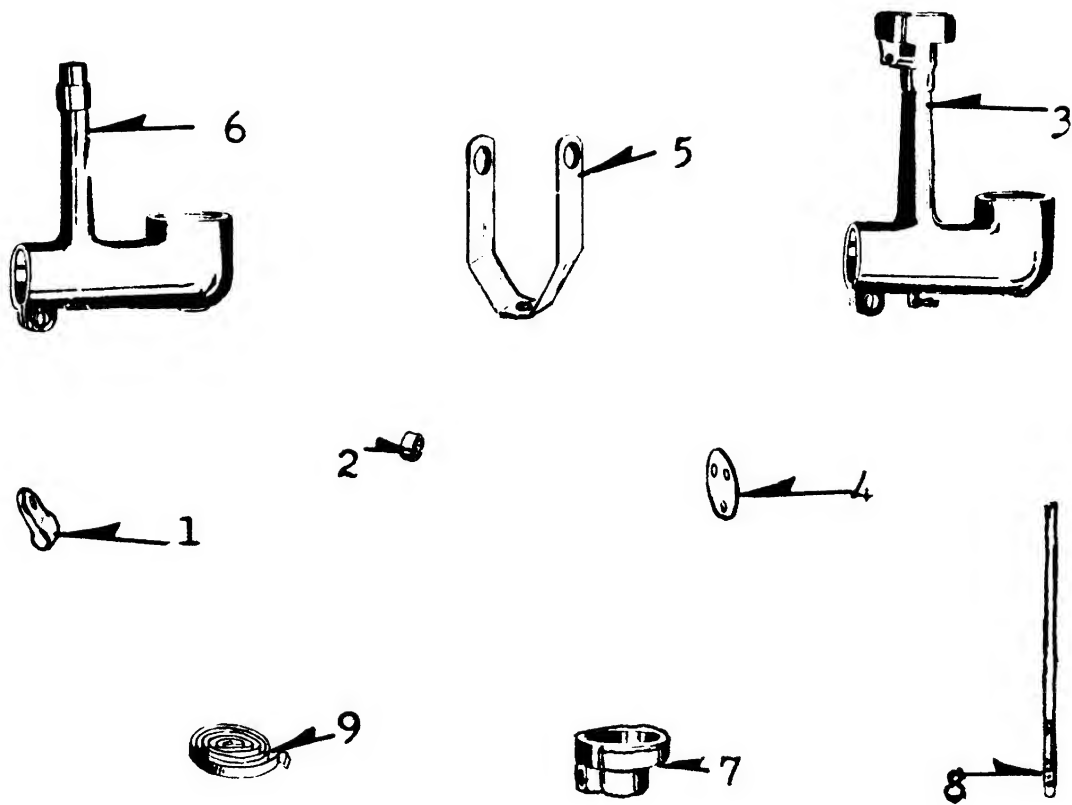


FIG.14 AUTOMATIC CHOKE GROUP

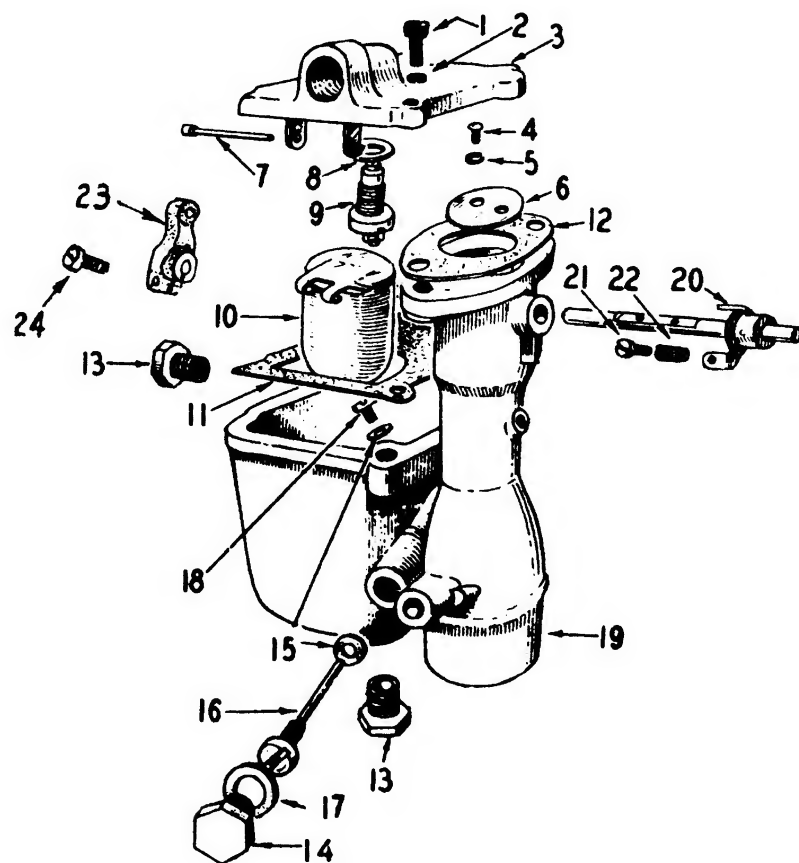


FIG. 15 CARBURETOR PARTS GROUP

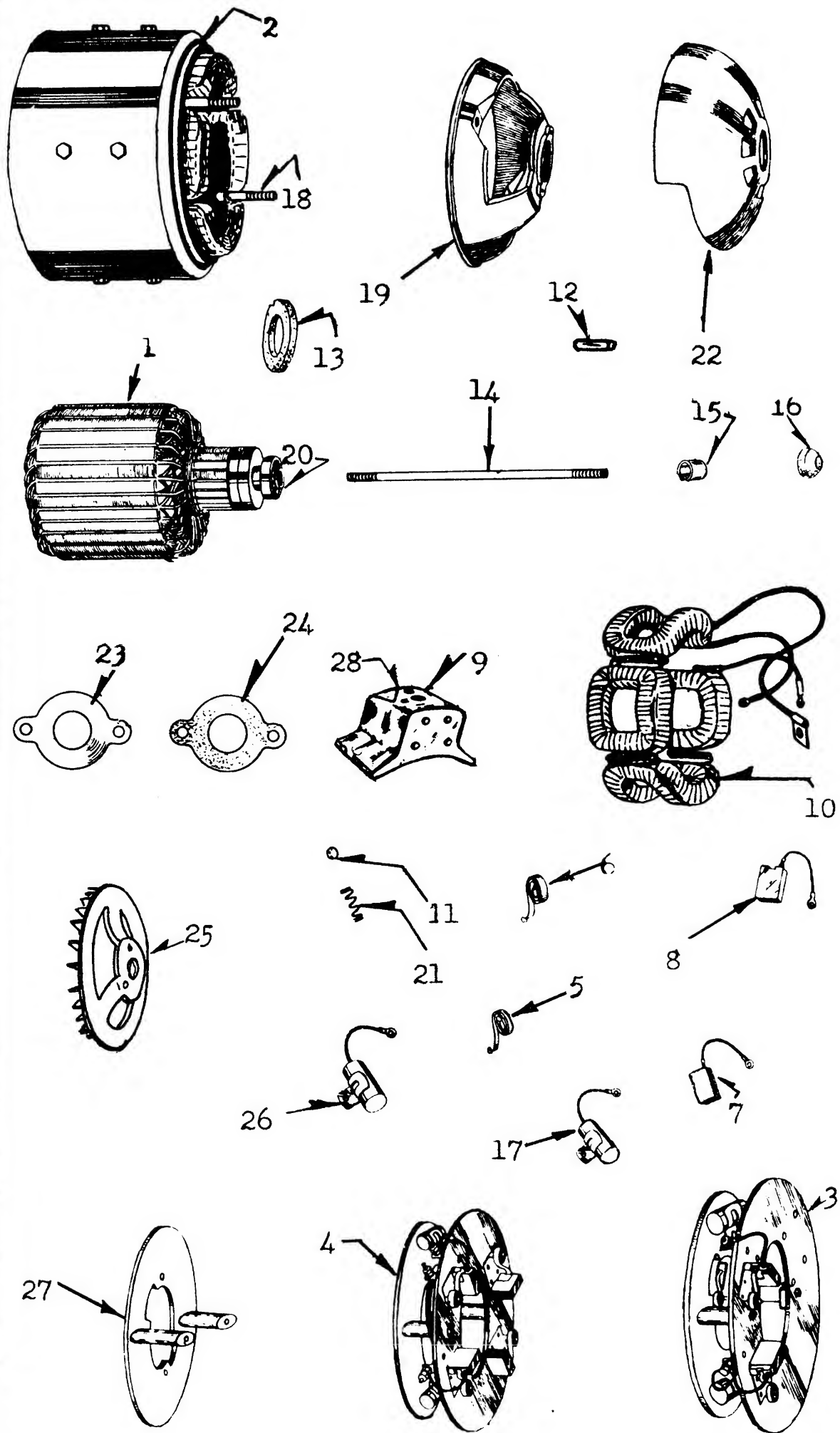


FIG. 16 GENERATOR GROUP

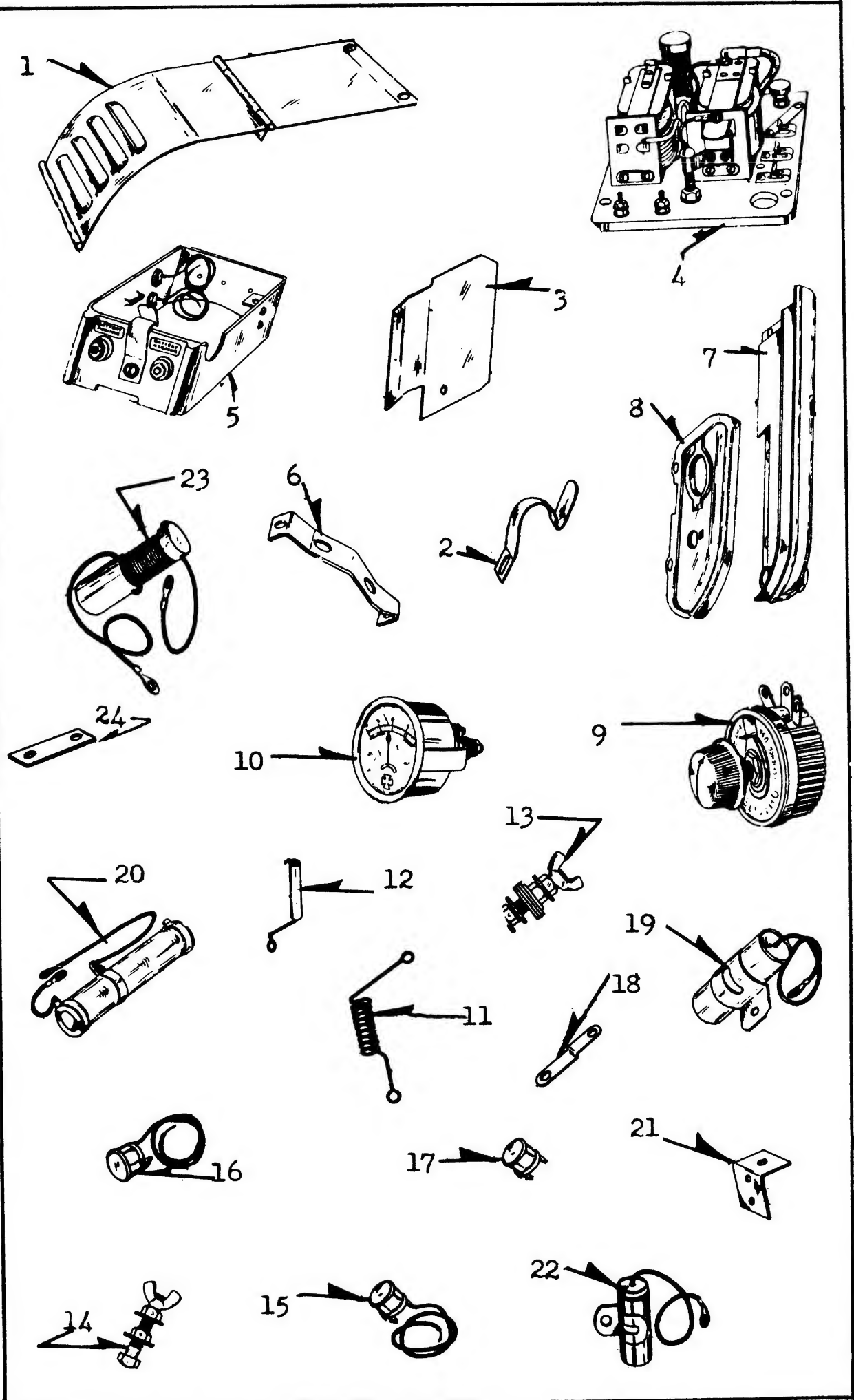


FIG. 17 CONTROL PANEL EQUIPMENT GROUP

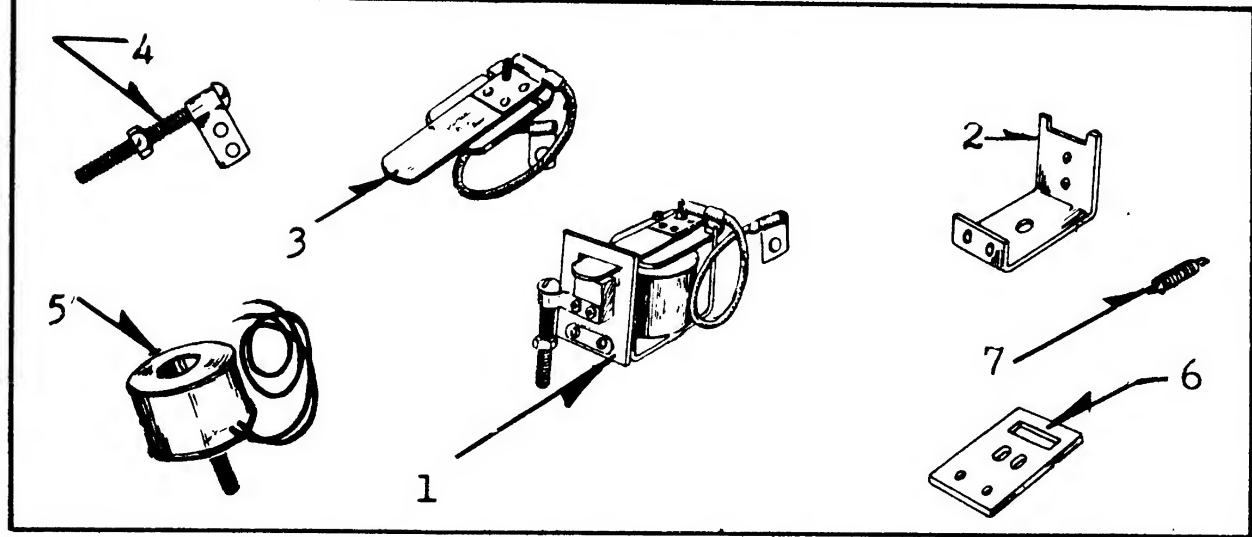


FIG. 18 START RELAY GROUP

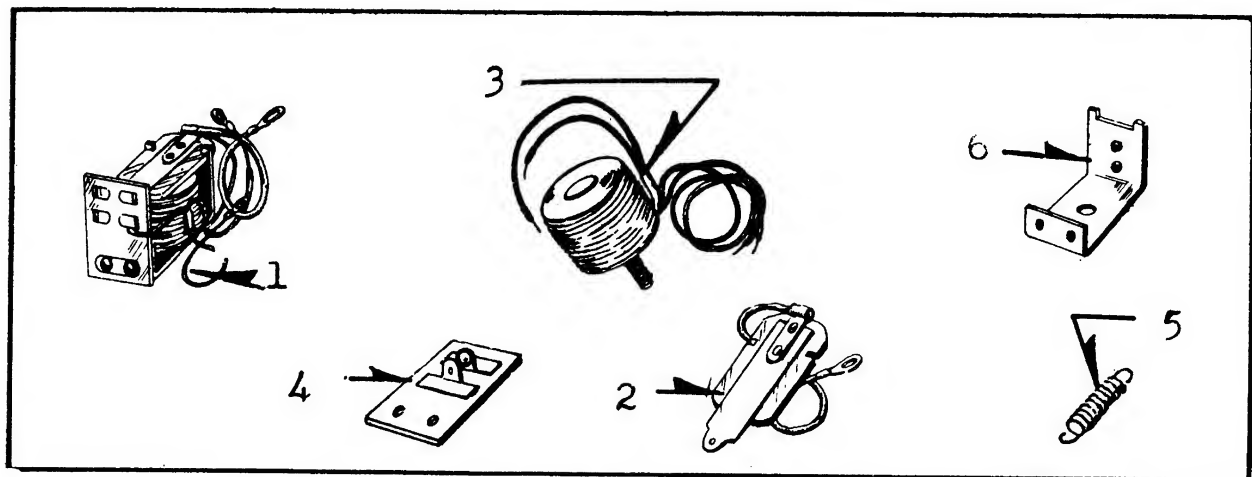


FIG. 19 CHARGE RELAY GROUP

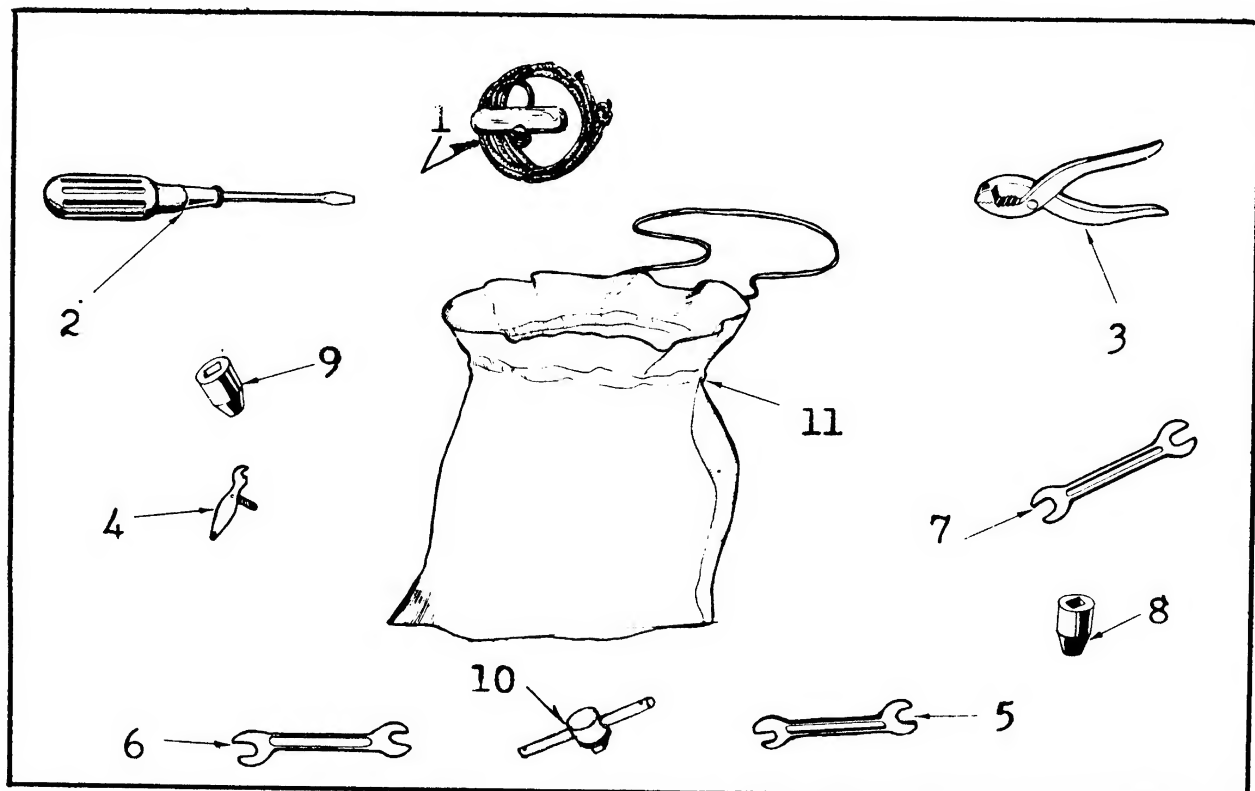


FIG. 20 TOOL GROUP



# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
CRANKCASE OIL BASE AND GEAR COVER GROUP (See Figure 1)				
1	150A48	Shaft, Governor .....	1	.60
2	150A49	Paddle, Governor Shaft .....	1	.15
3	400X5	Elbow, Inverted Male - Gear Cover .....	1	.21
4	559	Bearing, Governor Shaft Ball - 5/16" .....	1	.05
5	570	Seal, Crankcase Rear Oil .....	1	1.00
6	577	Gasket, Oil Base .....	1	.25
7	726	Cushion, Rubber Mounting - Upper .....	4	.15
8	737	Stud, Valve Inspection Plate .....	2	.10
9	1010A	Crankcase Assembly - Includes Bearing Plate and Bearings .....	1	25.00
10	1013	Plate, Oil Baffle .....	1	.30
11	1016A	Cap, Oil Filler - Electric Start Model .....	1	.60
12	1017	Gasket, Oil Filler Cap - Electric Start Model .....	1	.10
13	1018	Drain, Oil Filler and - Electric Start Model .....	1	2.50
14	1019	Gasket, Oil Filler and Drain - Electric Start Model .....	1	.10
15	1020	Base, Oil .....	1	4.50
16	1036	Gasket, Gear Cover .....	1	.30
17	1037	Pin, Generator and Gear Cover Dowel .....	3	.05
18	1820A	Cover, Gear, Assembly - Includes Cover, Gov.. Shaft, Gov. Paddle, Screws, Bearing, Washer and Cotter Pin .....	1	3.50
19	8127	Seal, Gear Cover Oil .....	1	.20
20	8920	Cushion, Rubber Mounting - Lower .....	4	.20
21	*	Plug, Oil Drain Pipe - 3/8" .....	1	.10
22	*	Plug, Crankcase Pipe - 1/2" - Oil Fill on the Manual Start Model .....	1	.10
	*	Nut, Hex. - 5/16"-18 - Oil Filler Cap .....	1	.01
	*	Screw, Hex. Hd. Cap - 3/8"-16 x 1" - Oil Base to Crankcase .....	4	.03
	*	Screw, Hex. Hd. Cap - 5/16"-18 x 1-1/2" - Oil Filler Cap .....	1	.03
	*	Screw, Hex. Hd. Cap - 5/16"-18 x 7/8" - (2) Oil Filler and Drain to Oil Base - (5) Gear Cover to Crankcase .....	7	.02
	*	Screw, Flat Head - #8-1/2" - Mount Oil Baffle Plate .....	2	.01
	*	Washer, Lock - 3/8"-1/8" x 3/32" - Oil Base to Crankcase .....	4	.01
	*	Washer, Plain - 21/64" x 1/16" x 9/16" - Copper - Oil Filler and Drain to Oil Base .....	2	.02
	*	Washer, Plain - 21/64" x 1/16" x 9/16" - (5) Gear Cover to Crankcase - (1) Governor Shaft .....	6	.01
	*	Pin, Cotter - 1/16" x 1/2" - Governor Shaft .....	1	.01

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
CYLINDER AND VALVE GROUP (See Figure 2)				
1	508-2	Grommet, Cylinder Air Housing Rubber .....	1	.05
2	528	Spring, Valve Follower Spacer .....	1	.15
3	540	Screw, Cylinder Head Cap .....	6	.10
4	541	Spacer, Cylinder Head Cap Screw .....	6	.05
5	542	Valve, Intake .....	1	.80
6	543B	Valve, Exhaust - Stellite .....	1	2.25
7	544B	Seat, Exhaust Valve - Stellite .....	1	2.25
8	545C	Spring, Valve .....	2	.15
9	547	Lock, Valve Spring .....	2	.05
10	576	Gasket, Cylinder Block .....	1	.20
11	603	Gasket, Cylinder Head .....	1	.65
12	758	Bearing, Cam Follower Lifter .....	2	.45
13	761	Screw, Cam Follower Lifter and Base to Bearing	2	.05
14	770B	Block, Cylinder - Includes 544B .....	1	11.25
15	1002H	Head, Cylinder .....	1	3.75
16	1051C	Housing, Cylinder Air - Manual Start Model ...	1	2.50
17	2019	Shaft, Cam Follower .....	1	.45
18	3008	Lifter and Base, Cam Follower .....	2	.65
19	3013	Washer, Valve Spring Retainer .....	2	.05
*		Screw, Hex. Hd. Cap - 3/8"-16 x 1" - Cylinder Block to Crankcase .....	4	.03
*		Screw, Rd. Hd. Mach. - 1/4"-20 x 3/8" - Cylinder Air Housing to Cylinder .....	4	.01
*		Washer, Lock - 3/8"-1/8" x 1/8" - Cylinder Block to Crankcase .....	4	.01
*		Washer, Lock - 1/4"-3/32" x 1/16" - Cylinder Air Housing to Cylinder .....	4	.01

## PISTON AND CONNECTING ROD GROUP (See Figure 3)

1	540	Screw, Connecting Rod Cap .....	2	.10
2	604PB	Piston - With Pin Fitted .....	1	4.25
3	608	Pin, Piston .....	1	.50
4	609	Ring, Piston Pin Lock .....	2	.05
5	610	Rod, Connecting - Complete - Includes 540 ....	1	3.75
6	79455	Rings, Set of - Includes 3 Compression and 1 Oil Ring .....	1	1.40
*		Washer, Lock - 5/16"-1/8" x 1/16" - Connecting Rod .....	2	.01

## CRANKSHAFT AND FLYWHEEL GROUP (See Figure 4)

1	104B58	** Crankshaft .....	1	11.50
2	1004	Nut, Crankshaft Gear .....	1	.50
3	1011A	Plate, Front Bearing - Includes Bearing .....	1	2.50
4	1049	Sheave, Rope .....	1	1.00

\*\* Order 1830B For Units with Only a Front  
Bearing Oil Line.

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
CRANKSHAFT AND FLYWHEEL GROUP (See Figure 4)				
5	1801	Stud, Flywheel - 3/8" x 4-1/2" - 1" of SAE - 3/4" of USS. ....	1	.25
6	1825A	Housing, Flywheel Blower .....	1	5.50
7	1833	Flywheel - Includes Hub and Magneto Magnet ...	1	12.00
8	1835	Bearing, Crankshaft - Main - Front and Rear ..	2	.75
9	2001	Gear, Crankshaft .....	1	3.25
*		Key, Woodruff - #9 - (1) Crankshaft Gear - (1) Flywheel .....	2	.05
*		Nut, Hex. - 3/8"-24 - Flywheel Stud .....	1	.02
*		Screw, Hex. Hd. Cap - 5/16"-18 x 7/8" - Front Bearing Plate to Crankcase .....	3	.02
*		Screw, Hex. Hd. Cap - 5/16"-18 x 5/8" - Blower Housing to Gear Cover .....	3	.01
*		Screw, Slotted Set - 5/16"-18 x 3/8" - Crank- shaft Gear Nut .....	1	.02
*		Washer, Lock - 3/8"-1/8" x 1/8" - Flywheel Stud .....	1	.01
*		Washer, Lock - 5/16"-1/8" x 1/16" - (3) Front Bearing Plate to Crankcase - (3) Blower Housing to Gear Cover .....	6	.01
*		Washer, Plain - 13/32"-1/32" x 7/8" - Flywheel Stud .....	1	.01
CAMSHAFT GROUP (See Figure 5)				
1	523	Bearing, Camshaft Rear .....	1	.65
2	527	Spacer, Camshaft Gear .....	1	.20
3	529	Plug, Hubbard .....	1	.05
4	549	Wire, Governor Weight Retainer .....	1	.20
5	1008	Bearing, Camshaft Front .....	1	.70
6	1836A	Gear, Camshaft - Includes Gear, Weights, and Retaining Wire .....	1	5.50
7	2084	Weight, Governor .....	4	.40
8	3007	Camshaft .....	1	6.00
*		Key, Woodruff - #9 - Camshaft Gear .....	1	.05
OIL PUMP AND ACCESSORIES GROUP (See Figure 6)				
1	120A41	By - Pass, Oil Pump, Assembly .....	1	1.00
2	511	Follower, Eccentric .....	1	.90
3	554	Body, Oil Pump .....	1	1.50
4	555	Plunger, Oil Pump .....	1	.60
5	556	Spring, Oil Pump Plunger .....	1	.10
6	557	Rod, Push .....	1	.25
7	559	Ball, Oil Pump Check - 5/16" .....	1	.05
8	562	Screen, Oil Pump .....	1	.30
9	1834A	Oil Pump Assembly - Includes 554 and 1872 ...	1	4.00
10	1872	Adapter, Dual Oil Line .....	1	1.50
11	1873	Line, Front Bearing Oil .....	1	.45
12	1874	Line, Rear Bearing Oil .....	1	.45

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
OIL PUMP AND ACCESSORIES GROUP (See Figure 6)				
13	2019	Shaft, Eccentric Follower .....	1	.45
14	12273C	Body and Deflector Cup, Oil Pump By - Pass ..	1	.80
15	12275	Valve, Oil Pump By - Pass Plunger .....	1	.15
16	12276	Screw and Nut, Oil Pump By - Pass Adjusting ..	1	.10
17	19160	Spring, Oil Pump By - Pass .....	1	.10
	*	Screw, Hex. Hd. Cap - 5/16"-18 x 7/8" - Oil Pump to Crankcase .....	2	.02
	*	Washer, Lock - 5/16"-1/8" x 1/16" - Oil Pump to Crankcase .....	2	.01

## GOVERNOR GROUP (See Figure 7)

1	565	Arm, Governor .....	1	.95
2	565A	Arm, Governor, Assembly - Complete - Includes 565, 567, 568, 569, 738, Cotter Pins, Screws, and Nuts .....	1	1.70
3	567	Spring, Governor Arm .....	1	.20
4	568	Ball Joint, Governor Arm .....	1	.20
5	569	Rod, Governor Arm to Carburetor Control ....	1	.30
6	738	Screw, Governor Spring Adjusting Thumb .....	1	.15
7	1041A	Cup and Stud, Governor, Assembly .....	1	.65
8	1046	Stud, Governor Spring Stop .....	1	.15
	*	Nut, Hex. - 1/4"-20 - Governor Arm .....	1	.01
	*	Nut, Hex. - #10/32 - (1) Ball Joint - (1) Gov. To Carburetor Rod .....	2	.01
	*	Screw, Hex. Hd. Cap - 1/4"-20 x 1" - Gov. Arm .....	1	.02
	*	Washer, Int. Tooth Lock - #1214 - Governor Arm .....	1	.01
	*	Washer, Int. Tooth Lock - #1210 - Ball Joint .....	1	.01
	*	Washer, Plain - 17/64"-1/32" x 9/16" - Adjusting Screw .....	1	.01
	*	Pin, Cotter - 1/16" x 3/8" - (1) Adjusting Screw - (2) Gov. to Carburetor Rod .....	3	.01

## AIR CLEANER GROUP (See Figure 8)

1	200X5	Connector, Inverted Male - Adapter .....	1	.14
2	1311	Sleeve, Air Cleaner Adapter .....	1	.05
3	1318A	Tube, Air Cleaner to Gear Cover Breather ..	1	.50
4	1332	Cleaner, Air .....	1	3.00
5	1333	Adapter, Air Cleaner .....	1	1.25
6	1334	Gasket, Air Cleaner Adapter .....	1	.15
7	1843	Support, Air Cleaner .....	1	.30

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
AIR CLEANER GROUP (See Figure 8)				
*		Screw, Rd. Hd. Mach. - 1/4"-20 x 1-1/2" - Air Cleaner to Adapter .....	3	.03
*		Screw, Rd. Hd. Mach. #10/32 x 1/2" - Support to Blower Housing .....	2	.01
*		Washer, Lock - 1/4"-3/32" x 1/16" - Air Cleaner to Adapter .....	3	.01
*		Washer, Lock - #10 - 1/16" x 3/64" - Support to Blower Housing .....	2	.01
MUFFLER AND MANIFOLD GROUP (See Figure 9)				
1	531	Manifold, Intake and Exhaust .....	1	1.75
2	573	Bolt, Manifold to Cylinder Block Square Hd. - 5/16"-18 x 4-1/2" .....	1	.15
3	581	Gasket, Intake and Exhaust Manifold .....	2	.05
4	584	Sleeve, Intake and Exhaust Manifold .....	2	.10
5	612	Nut, Intake and Exhaust Manifold Hex. ....	1	.30
6	613	Clip, Intake and Exhaust Manifold .....	1	.15
7	1346	Muffler, Exhaust .....	1	2.75
8	2382	Tubing, Flexible Exhaust - Includes Coupling and Nipples .....	1	2.50
*		Coupling, Pipe - 1" - Exhaust Tubing .....	1	.25
*		Screw, Rd. Hd. Mach. - 1/4"-20 x 1/2" - Clip to Manifold .....	1	.01
*		Washer, Lock - 5/16"-1/8" x 1/16" - Manifold Bolt .....	1	.01
*		Washer, Lock - 1/4"-3/32" x 1/16" - Clip to Manifold .....	1	.01
IGNITION GROUP (See Figure 10)				
1	508-2	Grommet, High Tension Cable Clip Rubber .....	1	.05
2	670	Plug, Spark - Champion #6M .....	1	.65
3	1028A	Point, Breaker Contact - Includes Nut .....	1	.35
4	1073	Clip, High Tension Cable .....	1	.20
5	1814	Clip, High Tension Cable Ground .....	1	.10
6	3408A	Shoe, Magneto Pole .....	1	1.00
7	8410	Coil, Magneto .....	1	2.40
8	8412A	Cable, High Tension Shielded - 22-1/2" .....	1	.45
9	8435	Backplate, Magneto, Only .....	1	1.50
10	8435A	Backplate, Magneto, Complete - Includes Coil, Shoe, Backplate, and etc. ....	1	7.50
11	8438	Bracket, Contact Point .....	1	.25
12	8440A	Arm, Breaker, Assembly - Includes Rubbing Block and Breaker Arm .....	1	.60
13	8441	Stud, Magneto Breaker Arm .....	1	.20

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
IGNITION GROUP (See Figure 10)				
14	8443	Spring, Magneto Breaker Arm .....	1	.15
15	8444	Condenser, Magneto - 0.2 MFD. ....	1	.75
16	8975	Arm and Point, Breaker, Assembly - Includes 1028A and 8440A .....	1	.95
17	12317A	Shield, Spark Plug, Assembly - Complete .....	1	.75
	*	Nut, Hex. - #10/32 - Spark Plug Shield .....	1	.01
	*	Nut, Hex. - #8/32 - Magneto Condenser .....	1	.01
	*	Screw, Rd. Hd. Mach. - 1/4"-20 x 1/2" - Backplate to Gear Cover .....	2	.01
	*	Screw, Rd. Hd. Mach. - #10/32 x 1-1/2" - Spark Plug Shield .....	1	.02
	*	Screw, Rd. Hd. Mach. - #8/32 x 3/8" - Mount Condenser .....	1	.01
	*	Screw, Rd. Hd. Mach. - #8/32 x 5/16" - Breaker Point .....	2	.01
	*	Screw, Rd. Hd. Mach. - #8/32 x 1/4" - Mount Condenser .....	1	.01
	*	Screw, Rd. Hd. Mach. - #12/24 x 7/8" - Magneto Pole Shoe .....	2	.01
	*	Washer, Int. Tooth Lock - 1/4" - Mount Magneto	2	.01
	*	Washer, Lock - 1/4" - Backplate to Gear Cover	2	.01
	*	Washer, Lock - #8/32 - 5/64" x 3/64" - Magneto Point Bracket .....	2	.01
	*	Washer, Lock - #6/32-5/64" x 1/32" - Magneto Pole Shoe .....	2	.01
	*	Washer, Plain - #8/32-3/8" x .172" x .032" - Brass - (1) Magneto Condenser - (2) Point Bracket .....	3	.02
	*	Washer, Plain - #6/32-5/16" x .147" x .028" - Brass - Magneto Breaker Point .....	2	.02
	*	Washer, Plain - #12 SAE - Magneto Pole Shoe .	2	.01

## BATTERY GROUP (See Figure 11)

1	416-34	Cable, Battery Positive - 3 Feet .....	1	.90
2	416-34	Cable, Battery Negative - 3 Feet .....	1	.90
3	416-4	Cable, Battery Jumper - 6-3/4" .....	1	.50
4	1748	Hydrometer, Battery .....	1	.75
5	75861	Battery .....	2	7.50

## ANTI-FLICKER BREAKER GROUP (See Figure 12)

1	582	Gasket, Valve Inspection Plate .....	1	.15
2	685	Clip, Breaker Cable .....	1	.10
3	1026	Plate, Breaker and Valve Inspection .....	1	1.75
4	1028A	Point, Breaker Contact - Includes Nut .....	2	.35

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
ANTI-FLICKER BREAKER GROUP (See Figure 12)				
5	1032B	Plunger, Breaker Spring .....	1	.25
6	1033	Seal, Breaker Spring Plunger .....	1	.10
7	1076	Dampener, Breaker Spring .....	1	.15
8	1077A	Spring and Point, Breaker - Includes Spring and Points .....	1	.75
9	1078A	Insulator, Breaker, Assembly - Includes Insulating Block and Contact Strip .....	1	.75
10	1080	Strip, Breaker Spring Clamp .....	1	.15
11	1082	Cover, Breaker .....	1	.30
12	1554	Strip, Breaker Insulator Connecting .....	1	.05
		Cable, Armored - #16-18-1/2" Long .....	1	
	*	Nut, Hex. - 5/16"-18 - Valve Inspection Plate	2	.01
	*	Screw, Rd. Hd. Mach. - #10/32 x 3/8" - Breaker Cover to Valve Inspection Plate ...	1	.01
	*	Screw, Rd. Hd. Mach. - #10/32 x 1/4" - Mount Connecting Strip .....	2	.01
	*	Screw, Rd. Hd. Mach. - #8/32 x 1/2" - (2) Breaker Insulator to Valve Inspection Plate - (2) Breaker Spring to Valve Inspection Plate .....	4	.01
	*	Washer, Int. Tooth Lock - #1208 - (2) Connect- ing Strip - (2) Breaker Spring to Valve Inspection Plate .....	4	.01
	*	Washer, Ext. Tooth Lock - #1110 - Breaker Cover to Valve Inspection Plate .....	1	.01
	*	Washer, Plain - 21/64-1/16" x 9/16" - Valve Inspection Plate .....	2	.01

## FUEL SYSTEM GROUP (See Figure 13)

1	501A7	Line, Flexible Fuel - Electric Start Model ..	1	1.25
2	501-3	Line, Fuel - Tank to Carburetor - Manual Start Model .....	1	.75
3	400X4	Elbow, Inverted Male - (1) Carburetor - (1) Fuel Pump - (1) Fuel Filter .....	3	.16
4	583	Gasket, Carburetor Flange .....	1	.10
5	585A	Cap, Fuel Tank - Includes Chain - Manual Start Model .....	1	.50
6	415A11	Tank, Fuel, Assembly - Includes Tank, 649B, 650, 650B, and 651A - Electric Start Model	1	3.50
7	649B	Cap, Fuel Tank - Electric Start Model .....	1	.15
8	650	Base, Fuel Tank Tube - Electric Start Model .	1	.40
9	650B	Gasket, Fuel Tank Tube Base - Electric Start Model .....	1	.10
10	651A	Tube, Fuel Tank - Includes Fitting - Electric Start Model .....	1	.45
11	656	Pump, Fuel, Complete - Includes Filter Bowl, Gaskets, Primer Lever, Etc. - Electric Start Model .....	1	6.50

\* A standard American hardware item.



# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
<b>AUTOMATIC CHOKE GROUP</b> (See Figure 14)				
1	666	Clip, Choke Tube .....	1	.15
2	637	Collar, Choke Shaft .....	1	.10
3	1300	Choke, Automatic, Assembly - Includes 637, 1301, 1302, 1304, 1305, 1306, and 1309 .....	1	7.50
4	1301	Butterfly, Choke .....	1	.25
5	1302	Yoke, Choke to Carburetor Mounting .....	1	.50
6	1304	Body, Choke .....	1	3.50
7	1305	Housing, Choke Thermostat .....	1	2.00
8	1306	Shaft, Choke .....	1	1.00
9	1309	Thermostat, Bi-Metal Spring .....	1	.75
*		Nut, Sq.- 1/4"-20 - Choke Mounting Yoke .....	1	.01
*		Screw, Fillister Hd. - 1/4"-20 x 3/4" .....	1	.01
*		Screw, Hex. Hd. Cap - 1/4"-20 x 3/4" - Choke Mounting Yoke .....	1	.01
*		Screw, Slotted Set - 1/4"-20 x 3/4" .....	1	.02
*		Screw, Rd. Hd. Mach. - #6/32 x 1/4" .....	2	.01
*		Washer, Lock - 1/4"-3/32" x 1/16" .....	1	.01
*		Washer, Lock - #6-1/32" x 5/64" .....	2	.01
*		Washer, Plain - 17/64"-1/32" x 9/16" - Brass .	1	.01

## CARBURETOR PARTS GROUP

(See Figure 15)

1	141-75	Screw, Cover Assembly - Zen. #T1S10-10 .....	2	.05
2	141-76	Washer, Cover Assembly Screw Lock - Zen. #T41-10 .....	2	.05
3	141-73	Cover, Bowl - Zen. #C6-4 .....	1	1.00
4	141-68	Screw, Throttle Plate - Zen. #T15B5-3 .....	2	.05
5	141-69	Washer, Throttle Plate Screw - Zen. #T41-5 ...	2	.05
6	141-33	Plate, Throttle - Zen. #C21-111 .....	1	.50
7	141-72	Axle, Float - Zen. #C121-14 .....	1	.10
8	141A77	Washer, Fuel and Valve Seat - Zen. #T56-23 ...	1	.05
9	141-16	Valve and Seat, Fuel - Zen. #C81-222 - Elec. Start Model .....	1	.75
9	141-23	Valve and Seat, Fuel - Zen. #C81-2-35 - Manual Start Model .....	1	.75
10	141-44	Float - Zen. #C85-8 .....	1	.65
11	141-74	Gasket, Bowl Cover - Zen. #C144-3 .....	1	.10
12	141-78	Gasket, Flange - Zen. #141-4-10 .....	1	.10
13	141-70	Plug - Zen. #CT91-3 - (1) Overflow Drain - (1) Bowl Drain .....	2	.10
14	141-43	Plug, Main Jet Passage - Zen. #C138-53 .....	1	.30
15	141-144	Washer, Main Jet Fibre - Zen. #T56-4 .....	1	.05
15	141-144	Washer, Compensator Jet - Zen. #T56-4 .....	1	.05
16	141-49	Jet, Main - Zen. #C52-20-12 - Electric Start Model .....	1	.75
16	141-45	Jet, Main - Zen. #C52-20-13 - Manual Start Model .....	1	.75
17	141-71	Washer, Main Jet Passage Plug - Zen. #T56-12 .	1	.05

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
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## CARBURETOR PARTS GROUP (See Figure 15)

18	141-50	Jet, Compensator - Zen. #C52-1-13 .....	1	.35
19	141-146	Body, Throttle - Zen. #C1-23-14 .....	1	3.50
20	141-65	Shaft and Stop Lever, Throttle - Zen. #C29-233	1	.65
21	141-66	Screw, Lever Stop and Shaft - Zen. #T11S6-7 ..	2	.05
22	141-67	Spring, Lever Stop and Shaft - Zen. #C111-12 .	2	.10
23	141-41	Lever, Throttle - Zen. #C24-99DX2 .....	1	.40
24	141-42	Screw, Throttle Lever Clamp - Zen. #T1S8-6 ...	1	.05
	141-47	Kit, Gasket - Zen. #C181-212 .....	1	.40
	141-51	Kit, Repair Parts - Zen. #C182-522 - Electric Start Model .....	1	2.30
	141-48	Kit, Repair Parts - Zen. #C182-512 - Manual Start Model .....	1	2.50

## GENERATOR GROUP (See Figure 16)

1	201A72	Armature Assembly - Man. & Elec. Start Model .	1	50.00
2	210A1035	Frame, Generator, Assembly - Includes Frame, Coils, and Pole Shoes - Electric Start Model	1	45.00
2	210A1072	Frame, Generator, Assembly - Includes Frame, Coils, and Pole Shoes - Manual Start Model	1	40.00
3	212B24	Rig, Brush, Assembly - Complete - Includes Brushes and Brush Springs - Manual Start Model .....	1	6.25
4	212B35	Rig, Brush, Assembly - Complete - Includes Brushes and Brush Springs - Electric Start Model .....	1	10.25
5	212A1003	Spring, D.C. Brush - Electric Start Model ....	4	.25
5	212A1003	Spring, D.C. Brush - Manual Start Model .....	2	.25
6	212A1004	Spring, A.C. Brush - Electric and Manual Start Models .....	2	.25
7	214A13	Brush, D.C. - Electric Start Model .....	4	.65
7	214A13	Brush, D.C. - Manual Start Model .....	2	.65
8	214A19	Brush, A.C. - Manual and Electric Start Models	2	.55
9	221A3	Shoe, Pole - Electric Start Model .....	4	2.00
10	222B1003	Coil, Field, Assembly - Electric Start Model .	1	20.00
10	222A1028	Coil, Field, Assembly - Manual Start Model ...	1	15.00
11	559	Lock, Armature Ball Bearing .....	1	.05
12	560	Pin, Generator Frame Dowel .....	1	.05
13	1114	Seal, Armature Arbor Oil .....	1	.10
14	1198	Stud, Armature Thru .....	1	.50
15	1200B	Bushing, Armature Thru Stud Centering .....	1	.05
16	1201	Seal, Armature Thru Stud Oil .....	1	.05
17	1222	Condenser, Brush Rig - 0.5 MFD - Manual Start Model .....	2	.75
18	1252	Stud, Generator Frame .....	2	.35
19	1260	Support, Generator Bearing .....	1	5.00
20	510-16	Bearing, Generator Ball .....	1	1.25

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
GENERATOR GROUP (See Figure 16)				
21	1262	Spring, Generator Ball Bearing Lock .....	1	.10
22	1265	Bell, Generator End .....	1	3.50
23	1266	Plate, Ball Bearing Retainer.....	1	.25
24	1267	Gasket, Ball Bearing Retainer Plate .....	1	.15
25	1270	Blower, Generator .....	1	2.50
26	5928	Condenser .....	3	.50
27	12672	Spider, Brush Rig .....	1	1.75
28	75206	Shoe, Pole - Manual Start Plant .....	4	1.75
*		Key, Generator Blower Woodruff - #5 .....	1	.05
*		Plug, Generator Bearing Slotted Pipe .....	1	.05
*		Nut, Cap - 3/8"-24 - Armature Thru Stud .....	1	.08
*		Nut, Hex. - 3/8"-24 - Generator Frame Stud ...	2	.02
*		Nut, Hex. - 5/16"-18 - Mount Spider and Re- taining Plate .....	2	.01
*		Nut, Hex. - #10/32 - Brass - Brush Rig - ( 6 used on Manual Start Model). .....	10	.02
*		Screw, Hex. Hd. Cap - 5/16"-18 x 1-3/8" - Mount Spider and Retaining Plate .....	2	.03
*		Screw, Hex. Hd. Cap - 5/16"-18 x 1-1/4" - Mount Pole Shoe .....	8	.03
*		Screw, Allenhead Set - 5/16"-18 x 5/8" - Mount Generator Blower .....	1	.05
*		Screw, Rd. Hd. Mach. - 5/16"-18 x 5/8" - Mount End Bell to Generator Frame .....	4	.01
*		Screw, Rd. Hd. Mach. - #10/32 x 3/4" - Brass - Brush Terminal - (3-Used on Manual Start Model). .....	5	.02
*		Screw, Rd. Hd. Mach. - #10/32x 1/2" - Insula- tor Ring to Spider .....	2	.01
*		Screw, Rd. Hd. Mach. - #8/32 x 1/4" - (1) - Condenser to End Bell - (2) Ground Jumper ..	3	.01
*		Washer, Int. - Ext. Tooth Lock - #4010 - Ground Jumper .....	2	.01
*		Washer, Int. Tooth Lock - #1210 - Brush Term. (6 Used on Manual Start Model). .....	5	.01
*		Washer, Ext. Tooth Lock - #1110 - (5) Brush Terminal (2) Insulator Ring to Spider. ....	7	.01
*		Washer, Ext. Tooth Lock - #1108 - Condenser to End Bell .....	1	.01
*		Washer, Lock - 3/8"-1/8" x 1/8" - (2) Gen. Frame Stud - (1) Armature Thru Stud .....	3	.01
*		Washer, Lock - 5/16"-1/8" x 1/16" - (4) Mount End Bell to Generator Frame - (2) Mount Spider and Retaining Plate .....	6	.01
*		Washer, Plain - 13/32" - 3/64" x 7/8" - Arm. Thru Stud .....	1	.01
*		Washer, Plain - 21/64"-1/16" x 3/4" - Mount Spider and Retaining Plate .....	2	.01
*		Washer, Plain - 1/32" x .200" x 7/16" - Brass - Brush Rig .....	10	.02
*		Washer, Plain - 1/32" x .200" x 7/16" - Insula- tor Ring to Spider - (3 Used on Manual Start Model) .....	2	.01

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
CONTROL PANEL EQUIPMENT GROUP (See Figure 17)				
1	1320A	Hood, Cylinder and Control, Assembly - Includes Hood and Hinge Pin .....	1	1.50
2	1321	Fastener, Cylinder and Control Hood Spring ..	1	.25
3	1324	Plate, Cylinder Air Baffle .....	1	.45
4	1400M	Panel, Control, Assembly - Includes Panel, Relays, Choke, Clips, Etc. ....	1	15.00
5	1405	Saddle, Control .....	1	2.50
6	1406	Bracket, Control Saddle Mounting .....	1	.35
7	1410	Panel, Control Saddle Side - Long .....	1	1.00
8	1412	Panel, Control Saddle Side - Short .....	1	.75
9	1412A	Rheostat - Model "J" 2 OHM Includes Knob ....	1	2.50
10	1412C	Ammeter, Charge - 10-0-10 .....	1	2.50
11	1412E	Resistor, Current Limiting - 5 Turns .....	1	.50
12	1412H	Porcelain, Resistance Unit .....	1	.35
13	1414A	Post, Terminal, Assembly - Battery Positive .	1	.25
14	1414C	Post, Terminal, Assembly - Battery Negative .	1	.20
15	1418A	Push Button, Plant Start, Assembly - Includes Button and Lead Wire .....	1	.60
16	1419A	Push Button, Plant Stop, Assembly - Includes Button and Lead Wire - Electric Start Model	1	.60
17	1419B	Push Button, Plant Stop - Manual Start Model	1	.60
18	1423	Strap, Ground .....	1	.05
19	1451	Condenser - 1.0 MFD .....	1	1.00
20	1470	Resistor - 1.5 OHMS- 4" Adjustable .....	1	1.00
21	1471	Bracket, Resistor .....	1	.10
22	5928	Condenser - 0.1 MFD .....	1	.50
23	75107	Coil, Choke, Assembly - Includes Coil, Coil Form, and Leads .....	1	.65
24	75108	Bracket, Choke Coil .....	1	.10
*		Clip, Fahnstock - #3 - (1) Control Panel - (1) Rheostat .....	2	.10
*		Clip, Fahnstock - #2 - (1) Control Panel - (1) Ammeter .....	2	.10
*		Clip, Fahnstock - #1 - Control Panel .....	1	.10
*		Bushing, Conduit - 1/2" - Side Panel For Generator Wires .....	1	
*		Nut, Hex. - 1/4"-20 - Resistor Mounting Brkt.	1	.01
*		Nut, Bakelite - #10/32 - Terminal .....	1	.01
*		Nut, Hex. - #10/32 - (1) Condenser to Saddle (1) Terminal .....	2	.01
*		Nut, Hex. - #8/32 - Brass - (7) Fahnstock Clips - (1) Ground Strap - (4) Mount Studs on Panel .....	12	.02
*		Screw, Rd. Hd. Mach. - 5/16"-18 x 5/8" - (2) Control Box to Saddle - (2) Saddle to Gen- erator Frame .....	4	.01
*		Screw, Rd. Hd. Mach. - 1/4"-20 x 4-1/2" - Resistor Bracket .....	1	.07
*		Screw, Rd. Hd. Mach. - 1/4"-20 x 5/8" - (2) Panel to Blower Housing - (4) Side Panels to Saddle .....	6	.01

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
CONTROL PANEL EQUIPMENT GROUP (See Figure 17)				
*		Screw, Rd. Hd. Mach. - 1/4"-20 x 3/8" - (2) Cylinder Hood to Air Housing - (1) Spring Fastener to Control Saddle .....	3	.01
*		Screw, Rd. Hd. Mach. - #10/32 x 7/8" - Terminal Stud .....	1	.01
*		Screw, Rd. Hd. Mach. - #10/32 x 1/2" - Resistor Bracket to Panel .....	2	.01
*		Screw, Rd. Hd. Mach. - #10/32 x 1/2" - Brass - Condenser to Saddle .....	1	.02
*		Screw, Rd. Hd. Mach. - #8/32 x 1" - Brass - Terminal Stud .....	1	.02
*		Screw, Rd. Hd. Mach. - #8/32 x 3/4" - Brass - Fahnstock Clips .....	3	.02
*		Screw, Rd. Hd. Mach. - #8/32 x 5/8" - Brass - (1) Fahnstock Clip - (1) Ground Strap .....	2	.02
*		Screw, Rd. Hd. Mach. - #8/32 x 5/16" - Resistor	1	.01
*		Washer, Ext. Tooth Lock - #1110 - (1) Condenser to Saddle - (3) Terminal .....	4	.01
*		Washer, Ext. Tooth Lock - #1108 - (1) Resistor Mounting - (1) Ground Strap - (4) Terminal Studs - (7) Fahnstock Clips.....	13	.01
*		Washer, Lock - 5/16"-1/8" x 1/16" - (2) Control Box to Saddle - (2) Saddle to Gen- erator Frame.....	4	.01
*		Washer, Lock - 1/4"-3/32" x 1/16" - (1) Resistor Bracket - (1) Spring Fastener - (2) Cylinder Hood - (2) Panel to Blower Housing - (4) Side Panels to Control Saddle	10	.01
*		Washer, Lock - #10-1/16" x 3/64" - Resistor Bracket .....	2	.01
*		Washer, Plain - 1/16" x 17/64" x 5/8" - (2) Panel to Blower Housing - (4) Side Panels to Control Saddle .....	6	.01
*		Washer, Plain - 1/32" x 17/64" x 9/16" - Spring Fastener .....	1	.01
*		Washer, Plain - 1/32" x .200" x 7/16" - Term.	2	.01
*		Washer, Plain - 1/32" x .172" x 7/16" - Brass - (3) Ground Strap - (5) Fahnstock Clips - (1) Resistor .....	9	.02

## START RELAY GROUP (See Figure 18)

1	1425A	Relay, Start, Assembly - Complete - Includes 1426, 1427A, 1428A, 1430, 1431, and 1517 ...	1	5.00
2	1426	Frame, Relay - Includes Spring Bracket and Spring .....	1	.95
3	1427A	Armature and Blade Assembly - Includes Lead Wire and Contact Point .....	1	1.10

\* A standard American hardware item.

# PARTS LIST

<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUAN. USED</u>	<u>PRICE EACH</u>
<b>START RELAY GROUP</b> (See Figure 18)				
4	1428A	Strap, Connector, Assembly .....	1	.35
5	1430	Coil, Relay .....	1	1.25
6	1431	Panel, Insulating .....	1	.40
7	1517	Spring, Armature Return .....	1	.10
<b>CHARGE RELAY GROUP</b> (See Figure 19)				
1	1445A	Relay, Charge, Assembly - Complete - Includes 1446A, 1448A, 1553A, 1630, and 1646A .....	1	4.50
2	1446A	Armature and Blade Assembly - Includes Lead Wire and Contact Points .....	1	.80
3	1448A	Coil and Core, Relay, Assembly .....	1	1.50
4	1553A	Panel, Insulating, Assembly - Includes Points	1	.80
5	1630	Spring, Armature Return .....	1	.10
6	1646A	Frame, Relay - Includes Spring Bracket and Spring .....	1	1.15
<b>TOOL GROUP</b> (See Figure 20)				
1	1057A	Rope, Starting - Includes Handle .....	1	.50
	1269	Lubricant, Tube of Generator Bearing .....	1	.45
2	77510	Screwdriver - 3" .....	1	.25
3	77535	Pliers - 6" .....	1	.30
4	77581	Wrench, Breaker Point .....	1	.10
5	77623	Wrench, Open End - 3/8" x 7/16" .....	1	.40
6	77624	Wrench, Open End - 7/16" x 1/2" .....	1	.45
7	77625	Wrench, Open End - 9/16" x 5/8" .....	1	.50
8	77661	Socket - 1/2" .....	1	.35
9	77662	Socket - 9/16" .....	1	.35
10	77678	Wrench, "T" Handle .....	1	1.50
11	77973	Bag, Cloth .....	1	.15
	1342	Handle, Carrying - Manual Start Plant .....	1	.60
	1343	Bracket, Carrying Handle - Manual Start Plant	1	.60
	1344	Clamp, Carrying Handle Bracket - Manual Start Plant .....	1	.30

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# MASTER PACKING LIST

M.P.L. #31A

Claims for shortage must be made within 5 days after receiving merchandise.  
Return this packing list with the claim to the address shown on nameplate of the unit or to the store where the plant was purchased.

ITEM	QUANTITY	DESCRIPTION
1	1	Complete generator unit
2	4	#726 Mounting rubbers, 1 $\frac{3}{4}$ " x I.D. 3/8" x O.D. 1"
3	1	#1057A Starter rope (44")
4	1	#1740A Remote start-stop switch and plate
5	1	#415A11 Fuel tank
6	1	#1346 Muffler 8" Powell
7	1	#2382 3 ft. length flexible exhaust tubing with fittings brazed on
8	1	#1269 Tube bearing grease
9	2	#416A34 Long battery cables (36")
10	1	#416A4 Short (jumper) cable (6 $\frac{3}{4}$ ")
11	1	#1748 Hydrometer
12	1	#1B-AC Instruction Manual
13	1	"Wiring Simplified" Manual
14	1	#417-13 Kit tools